MEASUREMENT AND TECHNICAL REPORT

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

DATE: 03 September 2003

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Cubic Tri-Reader 2, P/N 0001-1104	
FCC ID	LVCRTD01	
Date of Test	22 through 25 July 2003	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: **Defer until:**	No: X
Company Name agrees to notify the Commission by:	N/A	

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

Transition Rules Request per 15.37?	Yes:	No: X*

(*) FCC Part 15, Paragraph(s) **15.209(a), 15.225(a), 15.225(e) and 15.225(f); and IC RSS 210: 4.2.1; 6.2.2(e); 6.4; 7.2; 7.3**

Report Prepared by:

TÜV AMERICA, INC
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 546 3999
Fax: 858 546 0364

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1.0 GENERAL INFORMATION

1.1 Product Description

General Equipment Description

EUT Description: Contactless Proximity Card Reader (ISO 14443 compliant 13.56 MHz)

EUT Name: Cubic Tri-Reader 2

P/N No.: 0001-7062 and 0001-7064 (2 PCB assemblies that make up the TRI-Reader 2. Tri-Reader 2 including 2 boards is 0001-1104.

Product Options: --

Configurations to be tested: Standalone version "Puck", cabinet mounted version

Power Requirements

Voltage: 115 VAC (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: 1

Current (Amps/phase(max)): 1 Current (Amps/phase(nominal)): 0.1

Other: --

Other Special Requirements

--

Typical Installation and/or Operating Environment

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

Farecollection system

EUT Power Cable

■ Permanent OR ■ Removable Length (in meters): 2
☐ Shielded OR ■ Unshielded
☐ Not Applicable

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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
RS232/422	☐	■	--	■	☐	Foil over braid	--	9 pin D-Sub/RJ45	NA / 120 ohm	1	■	☐

EUT Software.

Revision Level: DSP12p8
FPG22p4
ARMn5_1_0_0 or ARMn7_1_0_0

Description: ARMn5_1_0_0 - works with PC interface
ARMn7_1_0_0 - continuous poll

EUT Operating Modes to be Tested

1. Continuously polling for cards

EUT System Components

Description	Model #	Serial #	FCC #
Power Supply	--	--	--

Support Equipment

Description	Model #	Serial #	FCC #
Compaq Laptop	Armada	1J8BCB23S08A	CNTTAI-32808-M5-E

Oscillator Frequencies

Frequency	Derived Frequency	Component # / Location	Description of Use
27.12 MHz	13.56 MHz	Y1 on 0001-7062	Clock for carrier frequency
32.768 kHz	1 Hz	Y2 on 0001-7062	RTC clock
58.9824 MHz	Various	U6 on 0001-7062	System Clock for CPU's

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Power Supply					
Manufacturer	**Model #**	**Serial #**	**Type**		
UME	UP0251Q-12P	TC029716	■ Switched-mode	(Frequency)	--
			☐ Linear ☐ Other	--	
Shindengen	EY244R5U	--	■ Switched-mode	(Frequency)	--
			☐ Linear ☐ Other	--	

Power Line Filters		
Manufacturer	**Model #**	**Location in EUT**
Corcom	6W1	In metal cabinet

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. N/A

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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	FCC CFR 47#	PASS/FAIL
Conducted Emissions	15.207(a) / RSS210, Para. 7.2	Pass
Radiated Emissions	15.209(a) / RSS210, Para. 7.3	Pass
Radiated Emissions/Output Power	15.225(a) / RSS210, Para. 6.2.2(e)	Pass
Frequency Stability	15.225(e) / RSS210, Para. 6.4	Pass
RF Tags	15.225(f)	Pass
Bandwidth	RSS210, Para. 4.2.1	Pass

Tests were 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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San Diego, CA 92121-2912
Phone: 858 546 3999
Fax: 858 546 0364

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 Block Diagram exhibit.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Equipment Modifications

None

2.5 Configuration of Test System

See Block Diagram exhibit.

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3.0 CONDUCTED EMISSIONS, 15.207(a) / RSS 210, Paragraph 7.2

3.1 CONDUCTED EMISSIONS EQUIPMENT

The CONDUCTED EMISSIONS (Interference Voltage) measurements were performed in the following location at the San Diego Testing Facility:

☐ **- Test not applicable**

■ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
9242-50-R-24-BNC	458	LISN	Solar Electronics Co.	--	Verified
ESHS 20	428	EMI Test Receiver	Rohde & Schwarz	837055/001	12/03
CAT-20	606	20 dB Attenuator	Mini-Circuits	--	NCR

Remarks: One year calibration cycle for all test equipment and sites.

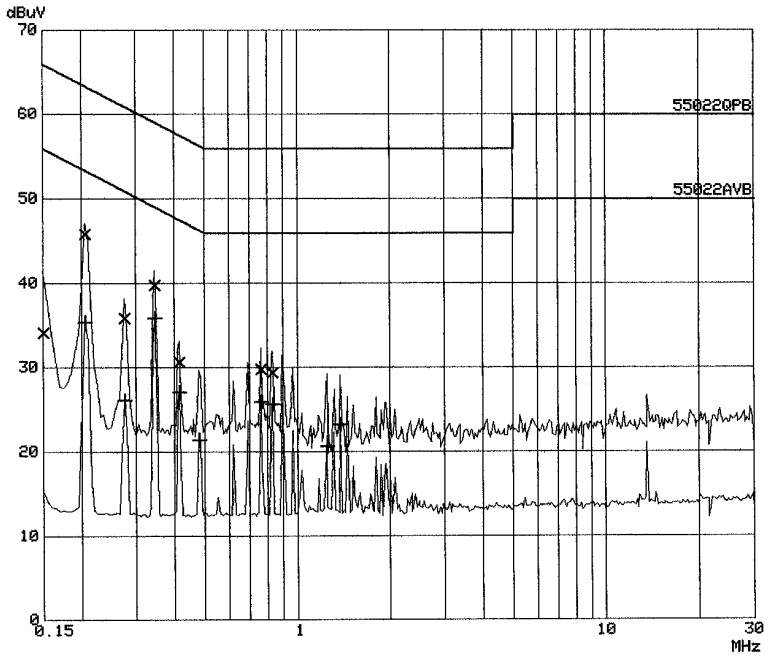
3.2 CONDUCTED EMISSIONS DATA

```
TUV America
Conducted Emissions
EUT:            Contactless Proximity Card Reader
Manuf:          Cubic Transportation Systems
Op Cond:        Continuous Polling for Cards
Operator:       A. Laudani
Test Spec:      EN55022 Class B
Comment:        115Vac 60Hz Line 1
                SC301979
Date:           23. Jul 03  09:56

Scan Settings (2 Ranges)
|--------- Frequencies -----------||----------- Receiver Settings ------------|
  Start       Stop         Step     IF BW  Detector  M-Time Atten Preamp OpRge
 150k          1M          5k         10k    PK+AV   100ms AUTO LN OFF   60dB
   1M         30M          5k         10k    PK+AV     2ms AUTO LN OFF   60dB

Transducer No. Start      Stop      Name
             1   100k      30M     20dBLISN

Final Measurement: x QP / + AV
                   Meas Time:    1 s
                   Subranges:   25
                   Acc Margin:  25dB
```



TUV America
Conducted Emissions

EUT: Contactless Proximity Card Reader
Manuf: Cubic Transportation Systems
Op Cond: Continuous Polling for Cards
Operator: A. Laudani
Test Spec: EN55022 Class B
Comment: 115Vac 60Hz Line 1
SC301979
Date: 23. Jul 03 09:56

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.15000	34.1	66.0
0.20500	45.8	63.4
0.27500	35.8	61.0
0.34500	39.8	59.1
0.41500	30.7	57.6
0.76000	29.8	56.0
0.83000	29.3	56.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.20500	35.4	53.4
0.27500	26.1	51.0
0.34500	35.8	49.1
0.41500	27.1	47.6
0.48000	21.4	46.4
0.76000	25.9	46.0
0.83000	25.6	46.0
1.24500	20.7	46.0
1.38000	23.2	46.0

* limit exceeded

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TUV America
Conducted Emissions

EUT: Contactless Proximity Card Reader
Manuf: Cubic Transportation Systems
Op Cond: Continuous Polling for Cards
Operator: A. Laudani
Test Spec: EN55022 Class B
Comment: 115Vac 60Hz Line 2
SC301979
Date: 23. Jul 03 10:03

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.20500	44.4	63.4
0.27500	34.1	61.0
0.34500	39.1	59.1
0.41500	30.3	57.6
0.76000	29.8	56.0
0.83000	29.7	56.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.20500	33.8	53.4
0.34500	34.8	49.1
0.41500	26.4	47.6
0.76000	26.0	46.0
0.83000	25.8	46.0
1.24000	21.0	46.0
1.38000	23.6	46.0

* limit exceeded

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TUV America
Conducted Emissions

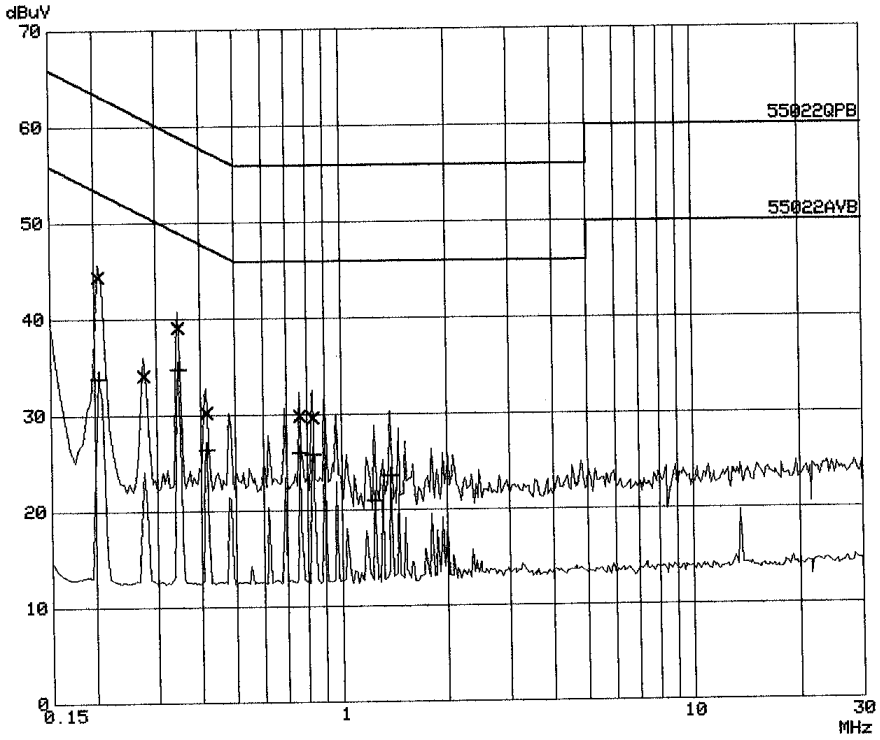
EUT: Contactless Proximity Card Reader
Manuf: Cubic Transportation Systems
Op Cond: Continuous Polling for Cards
Operator: A. Laudani
Test Spec: EN55022 Class B
Comment: 115Vac 60Hz Line 2
SC301979
Date: 23. Jul 03 10:03

Scan Settings (2 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	1M	5k	10k	PK+AV	100ms	AUTO	LN OFF	60dB
1M	30M	5k	10k	PK+AV	2ms	AUTO	LN OFF	60dB

Transducer No.	Start	Stop	Name
1	100k	30M	20dBLISN

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 25dB



4.0 RADIATED EMISSIONS / OUTPUT POWER, FCC Part 15.209(a) and 15.225(a)

4.1 RADIATED EMISSIONS / OUTPUT POWER EQUIPMENT

The RADIATED EMISSIONS measurements were performed at the San Diego Testing Facility:

☐ **- Test not applicable**

■ - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego
(Date of listing Aug. 30, 2000. Site Verification Valid for 3 years from listing.)

Testing was performed at a test distance of:

■ - 3 and 30 meters

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
FCC Part 15.209(a) at 3 meters					
LPB 2520/A	738	Bilog Antenna	Antenna Research	1169	08/03
ESVS 30	427	EMI Test Receiver	Rhode & Schwarz	830350/006	12/03
FCC Part 15.225(a) at 30 meters					
HFW-2-Z2	6628	Loop Antenna	Rhode & Schwarz	880.458/25	06/04
ESHS30	6509	EMC Receiver	Rhode & Schwarz	832354/004	05/04

Remarks: One year calibration cycle for all test equipment and sites. (*) No Calibration Required.

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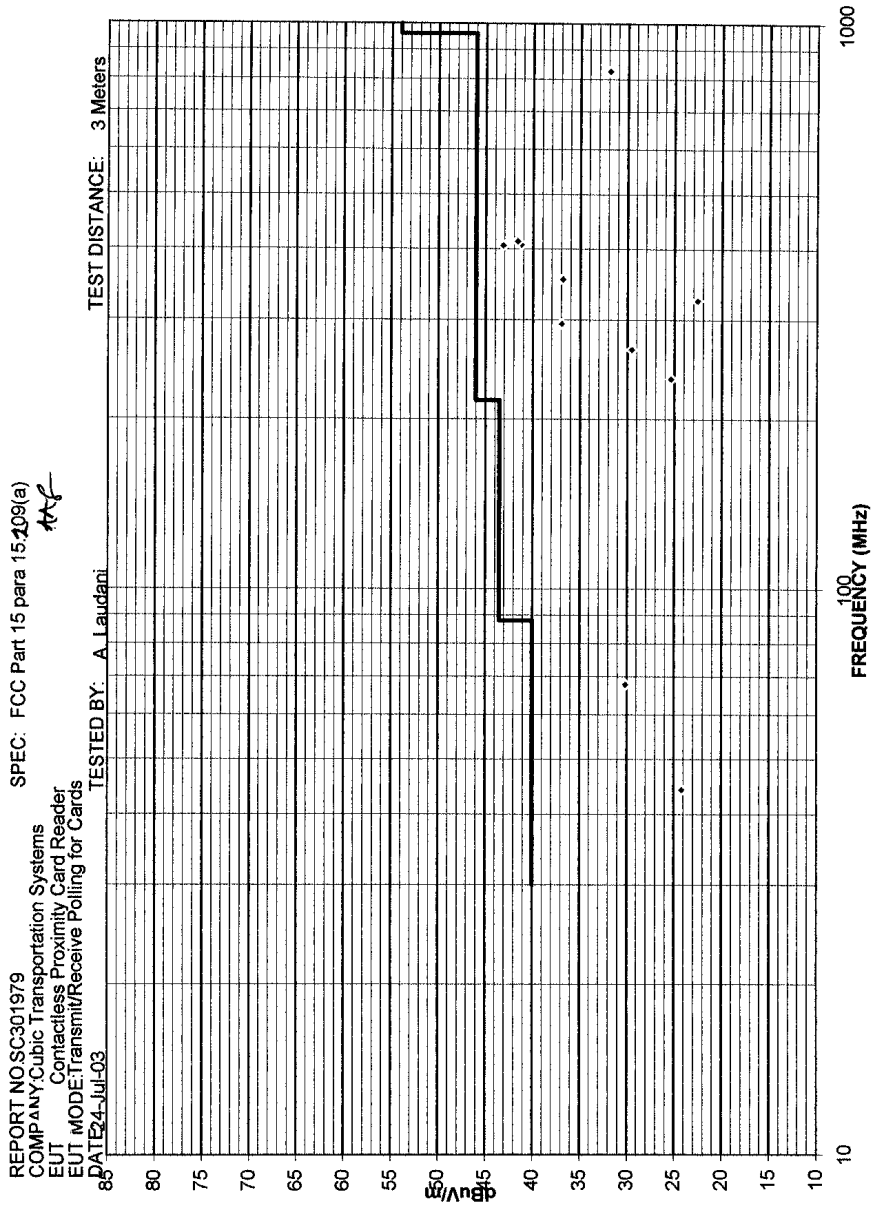
4.2 RADIATED EMISSIONS / OUTPUT POWER DATA



REPORT No: SC301979 SPEC: FCC Part 15 para 15.109(a)

CUSTOMER: Cubic Transportation Systems TEST DIST: 3 Meters

E U T: Contactless Proximity Card Reader TEST SITE: 1

EUT MODE: Transmit/Receive Polling for Cards BICONICAL: 738

DATE: 24-Jul-03 TESTED BY: A. Laudani LOG PERIODIC: 738

NOTES: Quasi-Peak with 120 KHz measurement bandwidth. RCVR: 427

115 Vac 60 Hz

Temperature: 28°C Relative Humidity: 44%

EUT MARGIN -2.8 dB at 405.49 MHz ver 1.8a

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)
44.22	6	-1.9	18.2	**24.2**	40	-15.8	0	1
67.79	20.1	11	10.1	**30.2**	40	-9.8	283	1
235.92	9.2	1.2	16.2	**25.4**	46	-20.6	24	1
265.41	8.5	12.5	17.0	**29.5**	46	-16.5	77	1
294.90	19.2	19.4	17.6	**37.0**	46	-9.0	30	1
324.40	4.3	3	18.3	**22.6**	46	-23.4	295	1
353.89	8.9	17.4	19.5	**36.9**	46	-9.1	61	1
405.49	22.3	21.4	20.9	**43.2**	46	-2.8	284	1
406.81	19.3	20.3	20.9	**41.2**	46	-4.8	292	1
412.86	20.4	18.4	21.2	**41.6**	46	-4.4	57	1.5
825.74	1.8	-1.1	30.1	**31.9**	46	-14.1	180	1

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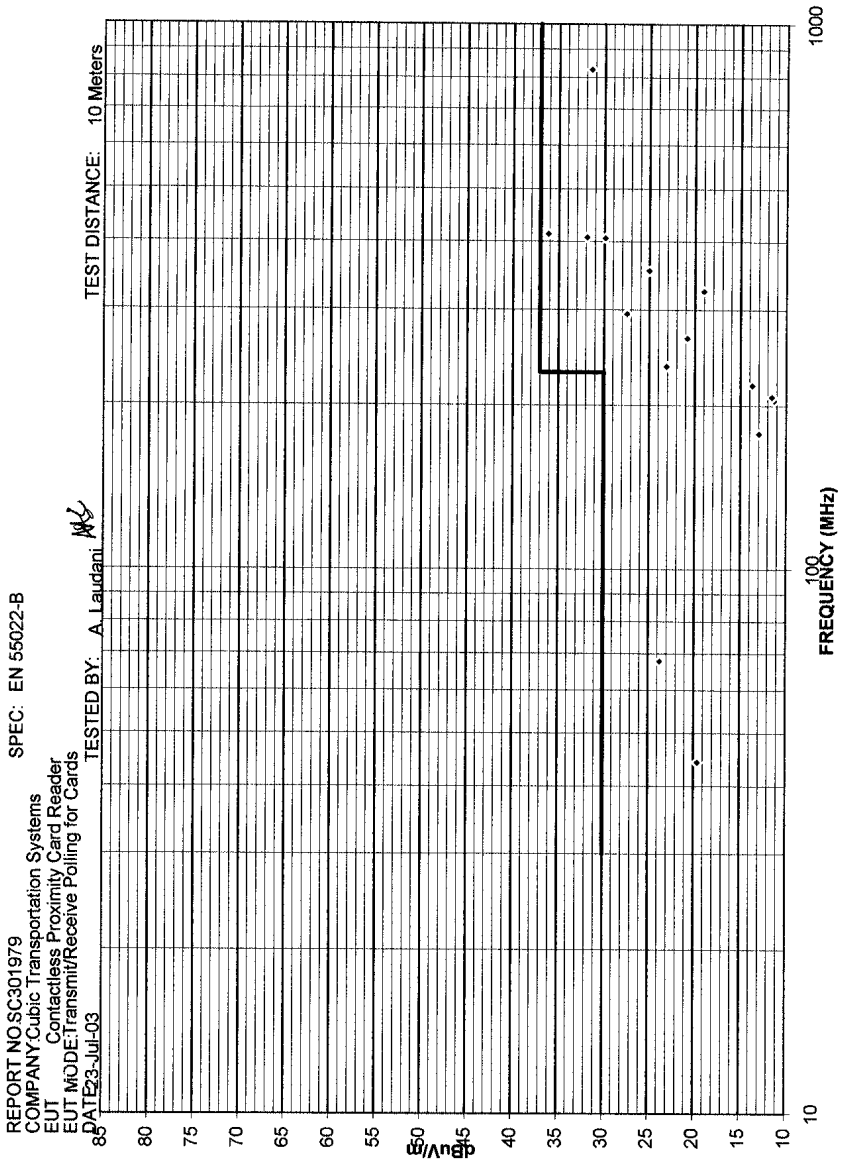
REPORT NO:SC301979
COMPANY:Cubic Transportation Systems
EUT Contactless Proximity Card Reader
EUT MODE:Transmit/Receive Polling for Cards
DATE:23-Jul-03
SPEC: EN 55022-B
TESTED BY: A. Laudani
TEST DISTANCE: 10 Meters
dBuV/m
FREQUENCY (MHz)
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
1000
100
10

REPORT No: SC301979 SPEC: EN 55022-B

CUSTOMER: Cubic Transportation Systems TEST DIST: 10 Meters

E U T: Contactless Proximity Card Reader TEST SITE: 1

EUT MODE: Transmit/Receive Polling for Cards BICONICAL: 738

DATE: 23-Jul-03 TESTED BY: A. Laudani LOG PERIODIC: 738

NOTES: Quasi-Peak with 120 KHz measurement bandwidth. RCVR: 427

115 Vac 60 Hz

Temperature: 31°C Relative Humidity: 46%

EUT MARGIN -0.8 dB at 412.87 MHz ver 1.8a

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)
44.20	1.2	-3.9	18.4	**19.6**	30	-10.4		1
67.79	13.5	5.9	10.3	**23.8**	30	-6.2	200	1
87.60	-2	-2.8	10.8	**8.8**	30	-21.2		1
149.80	-2.3	-2.7	10.9	**8.6**	30	-21.4		1
177.60	-1.6	0.5	12.5	**13.0**	30	-17.0		1
204.40	-2.3	-2.5	13.7	**11.4**	30	-18.6		1
207.40	-2.3	-2.6	13.9	**11.6**	30	-18.4		1
217.90	-1	-2.6	14.7	**13.7**	30	-16.3		1
235.90	4	7.2	15.9	**23.1**	37	-13.9	13	3
265.41	3.6	2.5	17.3	**20.9**	37	-16.1	38	1
294.90	5.3	10	17.5	**27.5**	37	-9.5	44	3
324.40	0.6	-0.5	18.5	**19.1**	37	-17.9	80	1
353.89	5.5	3.7	19.6	**25.1**	37	-11.9	43	1
405.49	7.4	9.1	20.8	**29.9**	37	-7.1	32	2
406.81	10.3	11	20.9	**31.9**	37	-5.1	157	2.5
412.87	14.5	14.8	21.4	**36.2**	37	-0.8	142	2.5
825.74	0.9	0.6	30.6	**31.5**	37	-5.5	73	2

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REPORT NO: SC301979 **DATE:** July 23, 2003

TEST: OUTPUT POWER & RADIATED EMISSIONS

CUSTOMER: CUBIC TRANSPORTATION SYSTEMS

EUT: CONTACTLESS PROXIMITY CARD READER

SPECIFICATION: FCC 47 PART 15.225(a) 15.209(a)

Frequency MHz	Average Vertical dBµV	Average Horizontal dBµV	Distance Factor dB	Correction Factor dB/m	Emission Level dBµV/m	Limit dBµV/m	EUT Margin dB
13.5606	25.7	—	—	1.8	27.5	84.0	-56.5
27.1212	21.3	—	—	1.8	23.1	29.5	-6.4

NOTES:
1. RBW = 10 kHz; ~~VBW =~~ QP
2. Receive antenna = LOOP
3. ~~Amplifier~~ Temp = 21°C, RH = 46%
4. 30 METERS
5. 27.1212 MHz = NOISE FLOOR, NO OTHER EMISSIONS DETECTED .009-30 MHz. IN RESTRICTED BAND 13.36 TO 13.41 MHz NO EMISSIONS DETECTED.

A. Landeros

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5.0 FREQUENCY STABILITY, 15.225(e) / RSS 210, Paragraph 6.4

5.1 FREQUENCY STABILITY EQUIPMENT

The FREQUENCY STABILITY measurements were performed at the San Diego Testing Facility:

☐ **- Test not applicable**

■ - SR-2, Shielded Room, 12' x 24' x 10', Metal Chamber
■ - TR-2, Test Room

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
SR-2					
HP8568B	187	Spectrum Analyzer	Hewlett Packard	--	04/04
7405	6437	Near-field Probe Set	EMCO	9812-4261	NCR
TR-2					
HP8568B	187	Spectrum Analyzer	Hewlett Packard	--	04/04
Versa Tenn III	6225	Environmental Chamber	Tenney Environmental	--	04/04
6843A	6810	Power Supply System	Agilent	3331A0018	04/04

Remarks: One year calibration cycle for all test equipment and sites. (*) No Calibration Required.

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5.2 FREQUENCY STABILITY DATA

FREQUENCY STABILITY

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TEST REPORT # SC301979

TEST AREA __TestRoom 2__

DATE _July 22, 2003__ **EUT MODEL #** Contactless Proximity Card Reader **TEMPERATURE** ___24__°C

SPECIFICATION (S): FCC 47 Part 15.225(e) **EUT SERIAL #** **HUMIDITY** _____62____%

EUT DESCRIPTION Contactless Proximity Card Reader **AIR PRESSURE** _100.1_kPa

Voltage Stability at 20°C

Frequency	Voltage	DELTA %	COMPLIES		REMARKS
13.560539	100 % / 115 Vac	0.0			Limit is 0.01 % of frequency
13.560535	115 % / 132.25 Vac	0.0000%	YES		
13.560534	85 % / 97.75 Vac	0.0000%	YES		

-19.4°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560617	0.0006%	YES	Limit is 0.01 % of frequency
2	13.560608	0.0005%	YES	
3	13.560621	0.0006%	YES	
4	13.560619	0.0006%	YES	
5	13.560610	0.0005%	YES	
6	13.560614	0.0006%	YES	
7	13.560620	0.0006%	YES	
8	13.560610	0.0005%	YES	
9	13.560617	0.0006%	YES	
10	13.560617	0.0006%	YES	

-9.8°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560597	0.0004%	YES	Limit is 0.01 % of frequency
2	13.560606	0.0005%	YES	
3	13.560600	0.0004%	YES	
4	13.560608	0.0005%	YES	
5	13.560602	0.0005%	YES	
6	13.560616	0.0006%	YES	
7	13.560613	0.0005%	YES	
8	13.560613	0.0005%	YES	
9	13.560612	0.0005%	YES	
10	13.560618	0.0006%	YES	

TESTED BY: A. Laudani

REVIEWED BY:

FREQ STAB.doc 5/22/02

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FREQUENCY STABILITY

TEST REPORT # SC301979

TEST AREA __TestRoom 2__

DATE _July 22, 2003__ **EUT MODEL #** Contactless Proximity Card Reader **TEMPERATURE** ___24__°C

SPECIFICATION (S): FCC 47 Part 15.225(e) **EUT SERIAL #** **HUMIDITY** _____62____%

EUT DESCRIPTION Contactless Proximity Card Reader **AIR PRESSURE** _100.1_kPa

-0.1°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560617	0.0006%	YES	Limit is 0.01 % of frequency
2	13.560617	0.0006%	YES	
3	13.560613	0.0005%	YES	
4	13.560602	0.0005%	YES	
5	13.560612	0.0005%	YES	
6	13.560607	0.0005%	YES	
7	13.560601	0.0005%	YES	
8	13.560601	0.0005%	YES	
9	13.560598	0.0004%	YES	
10	13.560602	0.0005%	YES	

+9.8°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560609	0.0005%	YES	Limit is 0.01 % of frequency
2	13.560593	0.0004%	YES	
3	13.560592	0.0004%	YES	
4	13.560592	0.0004%	YES	
5	13.560590	0.0004%	YES	
6	13.560583	0.0003%	YES	
7	13.560579	0.0003%	YES	
8	13.560577	0.0003%	YES	
9	13.560572	0.0002%	YES	
10	13.560566	0.0002%	YES	

TESTED BY: A. Laudani

REVIEWED BY:

FREQ STAB.doc 5/22/02

FREQUENCY STABILITY

TEST REPORT # SC301979

TEST AREA __TestRoom 2__

DATE _July 22, 2003__ **EUT MODEL #** Contactless Proximity Card Reader **TEMPERATURE** ___24__°C

SPECIFICATION (S): FCC 47 Part 15.225(e) **EUT SERIAL #** **HUMIDITY** _____62____%

EUT DESCRIPTION Contactless Proximity Card Reader **AIR PRESSURE** _100.1_kPa

+20.1°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560576	0.0003%	YES	Limit is 0.01 % of frequency
2	13.560575	0.0003%	YES	
3	13.560573	0.0003%	YES	
4	13.560565	0.0002%	YES	
5	13.560666	0.0009%	YES	
6	13.560566	0.0002%	YES	
7	13.560555	0.0001%	YES	
8	13.560545	0.0000%	YES	
9	13.560540	0.0000%	YES	
10	13.560539	0.0000%	YES	Taken as Reference

+29.7°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560542	0.0000%	YES	Limit is 0.01 % of frequency
2	13.560535	0.0000%	YES	
3	13.560530	-0.0001%	YES	
4	13.560524	-0.0001%	YES	
5	13.560526	-0.0001%	YES	
6	13.560522	-0.0001%	YES	
7	13.560522	-0.0001%	YES	
8	13.560523	-0.0001%	YES	
9	13.560517	-0.0002%	YES	
10	13.560511	-0.0002%	YES	

TESTED BY: A. Laudani

REVIEWED BY:

FREQ STAB.doc 5/22/02

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FREQUENCY STABILITY

TEST REPORT # SC301979

TEST AREA __TestRoom 2__

DATE _July 22, 2003__ **EUT MODEL #** Contactless Proximity Card Reader **TEMPERATURE** ___24__°C

SPECIFICATION (S): FCC 47 Part 15.225(e) **EUT SERIAL #** **HUMIDITY** _____62____%

EUT DESCRIPTION Contactless Proximity Card Reader **AIR PRESSURE** _100.1_kPa

+40.1°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560507	-0.0002%	YES	Limit is 0.01 % of frequency
2	13.560511	-0.0002%	YES	
3	13.560507	-0.0002%	YES	
4	13.560513	-0.0002%	YES	
5	13.560514	-0.0002%	YES	
6	13.560507	-0.0002%	YES	
7	13.560499	-0.0003%	YES	
8	13.560503	-0.0003%	YES	
9	13.560497	-0.0003%	YES	
10	13.560492	-0.0003%	YES	

+50.1°C

Min.	Frequency	DELTA %	COMPLIES	REMARKS
1	13.560490	-0.0004%	YES	Limit is 0.01 % of frequency
2	13.560481	-0.0004%	YES	
3	13.560479	-0.0004%	YES	
4	13.560474	-0.0005%	YES	
5	13.560465	-0.0005%	YES	
6	13.560476	-0.0005%	YES	
7	13.560476	-0.0005%	YES	
8	13.560471	-0.0005%	YES	
9	13.560478	-0.0004%	YES	
10	13.560474	-0.0005%	YES	

NOTES: _____

TESTED BY: A. Laudani

REVIEWED BY: _____

FREQ STAB.doc 5/22/02

6.0 RF TAGS, 15.225(f)

6.1 RF TAGS DATA

The tags associated with this equipment are not powered but disturb the RF field from the Tri-Reader 2.

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7.0 BANDWIDTH, RSS 210, Paragraph 4.2.1

7.1 BANDWIDTH EQUIPMENT

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

☐ **- Test not applicable**

■ - SR-3, Shielded Room, 12’ x 20’ x 8’, Metal Chamber

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
HP8566B	823	Spectrum Analyzer	Hewlett Packard	2318A05571	08/03
7405	6437	Near-field Probe Set	EMCO	9812-4261	NCR

Remarks: One year calibration cycle for all test equipment and sites. (*) No Calibration Required.

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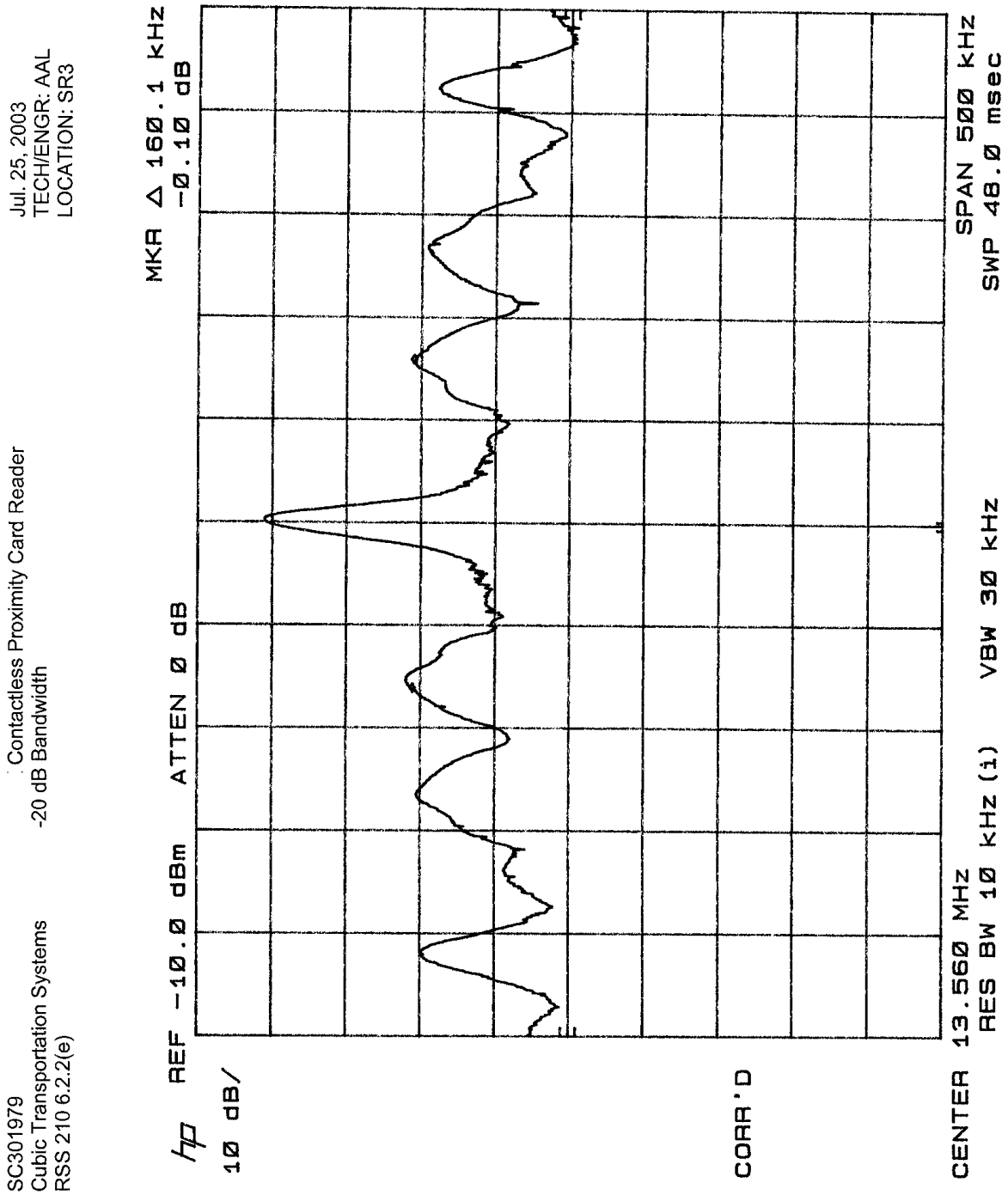
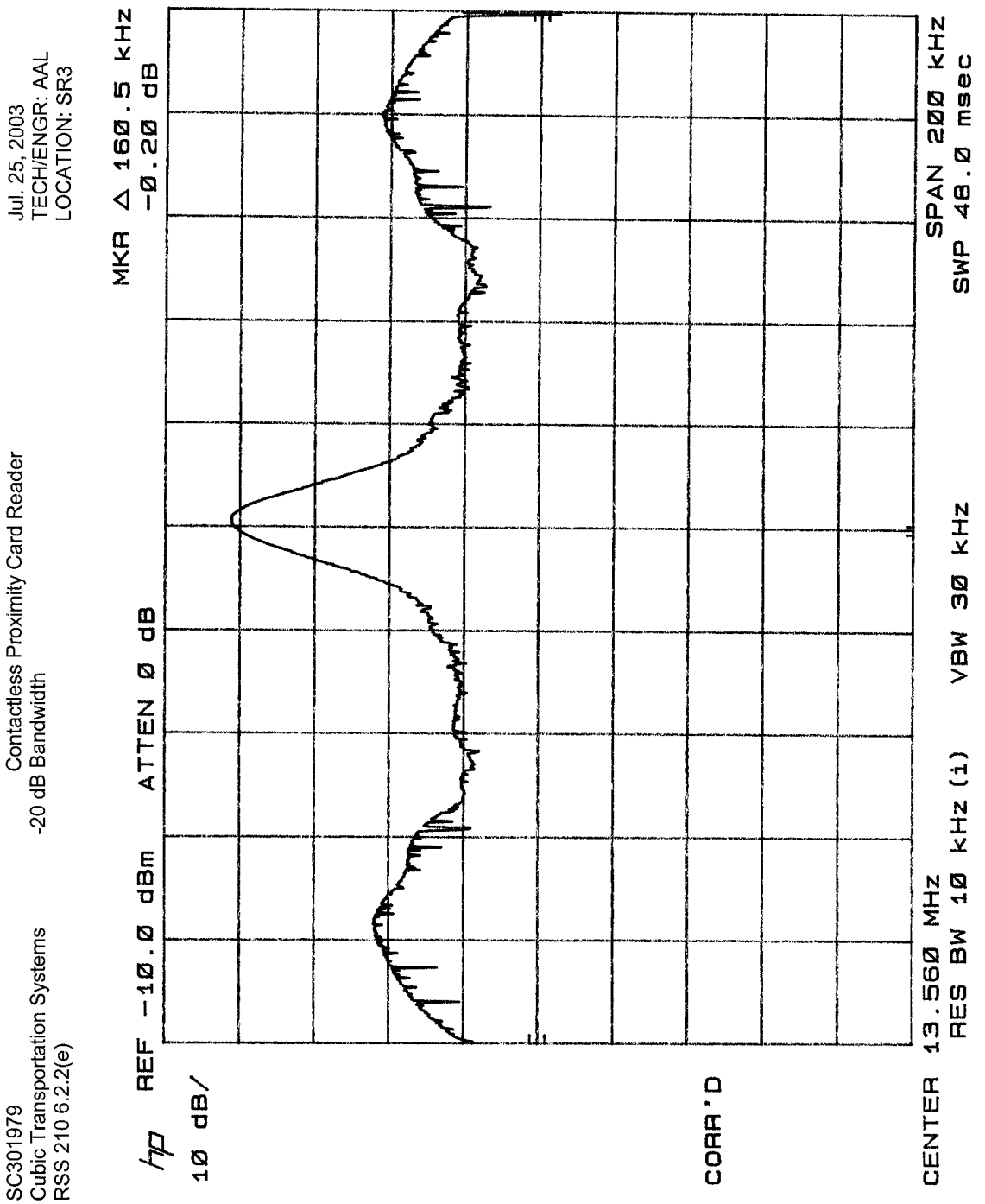
7.2 BANDWIDTH DATA




Jul. 25, 2003
TECH/ENGR: AAL
LOCATION: SR3
Contactless Proximity Card Reader
-20 dB Bandwidth
SC301979
Cubic Transportation Systems
RSS 210 6.2.2(e)
MKR Δ 160.5 kHz
-0.20 dB
REF -10.0 dBm
ATTEN 0 dB
10 dB/
CORR'D
CENTER 13.560 MHz
RES BW 10 kHz (i)
VBW 30 kHz
SPAN 200 kHz
SWP 48.0 msec

8.0 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests were performed per CFR 47, FCC Part 15, Paragraph(s) 15.209(a), 15.225(a), 15.225(e) and 15.225(f); and IC RSS 210: 4.2.1; 6.2.2(e); 6.4; 7.2; 7.3.

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, FCC Part 15, Paragraph(s) 15.209(a), 15.225(a), 15.225(e) and 15.225(f); and IC RSS 210: 4.2.1; 6.2.2(e); 6.4; 7.2; 7.3.

Testing Start Date: 22 July 2003

Testing End Date: 25 July 2003

- TÜV AMERICA, INC. -

Responsible Engineer:

Jim Owen
(EMC Chief Engineer)

Responsible Engineer:

Alan Laudani
(EMC Engineer)

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