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**Report of Measurements
of Electromagnetic Compatibility Testing**

Test Report File No.	:	NC4085	Date of issue: January 7, 2002
Applicant	:	Hafele	
Model / Serial No.	:	Locker Lock /	
Product Type	:	Access controller	
Power Supply	:	6VDC Battery operated	
Manufacturer	:	Same As Applicant	
License holder	:	Same As Applicant	
Address	:	3901 Cheyenne Dr. P.O Box 4000 Archdale, NC 27263	
Test Type	:	<input checked="" type="checkbox"/> Compliance Investigation <input type="checkbox"/> Manufacturer's Specification	
Test Project Number	:	00ME10760	
References(s)	:	FCC ID: PW3102	

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1.0 G E N E R A L - Product Description

The EUT (equipment under test) is a stand-alone device that is utilized to perform as a dead bolt lock. The device operates by using an intentional radio frequency (RF) to a pre-programmed transponder key. The transponder keys are passive devices that take the energy from the magnetic field of the EUT then sends the information stored within it to the EUT.

The EUT operated at an intentional radiation frequency of 134kHz.

The transmitting antenna is not removable.

1.1 Device Configuration During Test

The device under test was configured to continuously transmit the radio frequency of 134kHz.

The device was tested in its normal orientation. All other orientations were examined. The data contained in this report represents the worst case axis.

The device was powered with 4 AA batteries (6VDC) using fresh batteries.

"The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report"

1.2 Deviations from ANSI C63.4

☒ Not Applicable

1.3 Device Modifications Necessary for Compliance

☒ N/A

Environmental conditions in the lab:

	<u>Range</u>
Temperature:	20-25°C
Relative Humidity	30 - 60 %
Atmospheric pressure	680 - 1060 mbar

2.0 EMISSIONS TEST REGULATIONS

FCC Part 15, Subpart C, 15.109 and 15.209

FCC Part 15, Subpart B, Class B

2.1 EUT OPERATION MODE - EMISSIONS TESTS

- ☐ Standby
- ☐ Test program (H-Pattern)
- ☐ Test program (color bar)
- ☐ Test program (customer specific)
- ☐ Practice operation
- ☐ Normal operation Mode:
- ☒ As per manufacturer's instructions: Continuous Operation

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2.1.1 Radiated Emissions Test (10 Meter Semi-Anechoic Chamber)

☒ **Test Applicable** ☐ **Test Not Applicable**

120kHz – 30MHz using Magnetic loop Antenna

The measurement antenna distance ☒ 3 ☐ 10 meters from the EUT.

30MHz – 1000MHz

The measurement antenna distance ☒ 3 ☐ 10 meters from the EUT.

Tests were performed on the transmitter in accordance with the limitation set forth by CFR47 FCC Part 15 Subpart B, Class B, Paragraphs 15.209 and tested in accordance with the test procedures and methodologies in ANSI C63.4:1992.

The EUT was checked throughout the frequency band 120kHz to 1000MHz. The transmitter operated at 134kHz. The allowable field strength limits in accordance with 15.209 were applied to the fundamental frequency. All other emissions were tested in accordance with the general limitations 15.209.

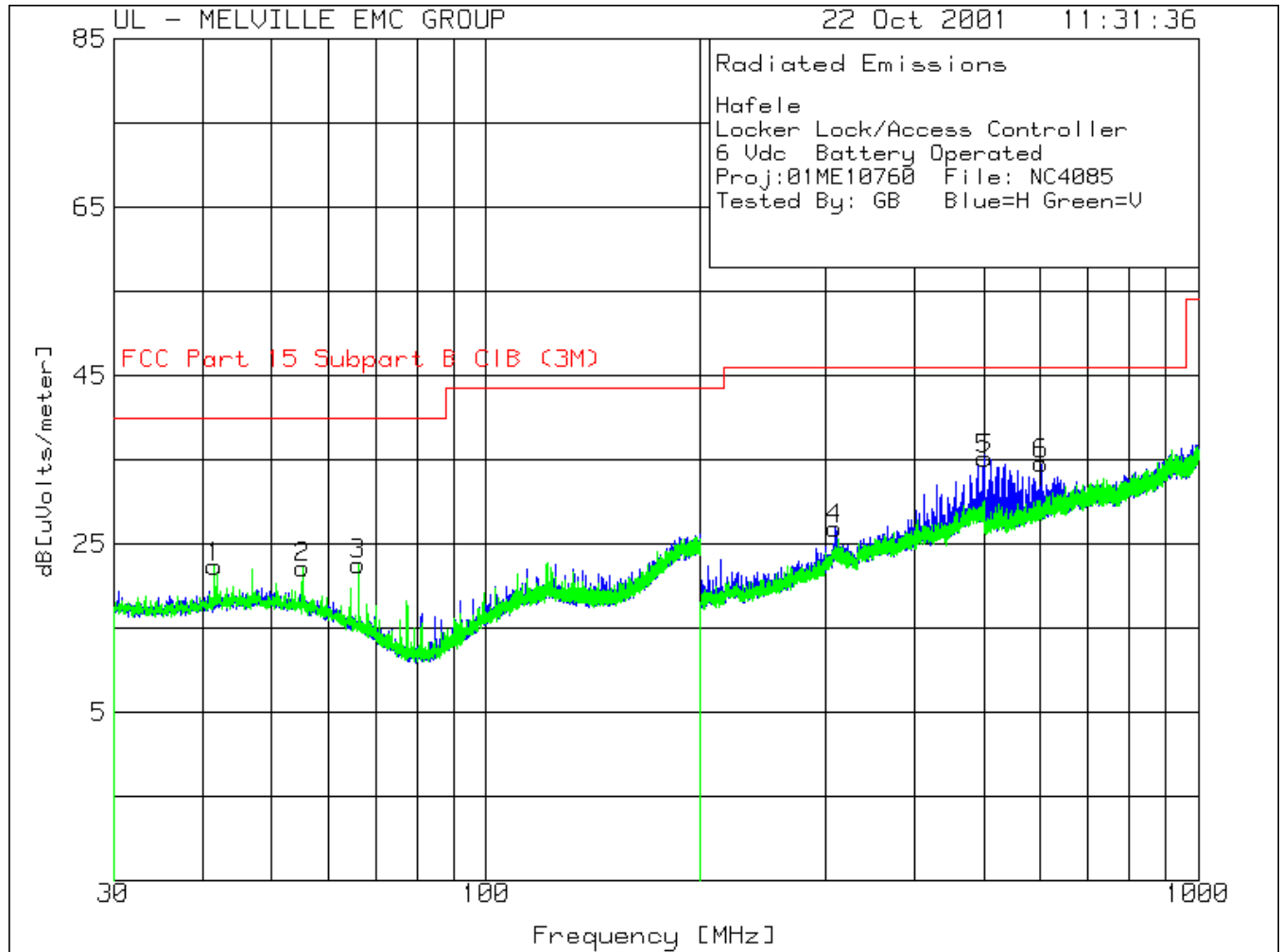
From 120kHz to 30MHz, measurements were made at a distance of 3 meters. The limit was adjusted to a 3-meter limit using the 40dB/decade-limit extrapolation method.

Test equipment used for final radiated emissions tests:

<input checked="" type="checkbox"/> HP 8574A	Hewlett-Packard	EMI Reciever,	Equipment No.: ME5A-461
Range: .1 – 1000MHz	Last Calibration Date: 01-27-01	Calibration Due Date: 01-27-02	
Consisting of:			
	HP - 8566B	Hewlett-Packard	Spectrum Analyzer,
		Resolution BW: 1MHz	
		Video BW: 1MHz	
	HP - 85662A	Hewlett-Packard	Analyzer Display
	HP - 85650A	Hewlett-Packard	Quasi-Peak Adapter,
		BW: 120kHz	
	HP - 85685A	Hewlett-Packard	Preselector

Test Accessories for Radiated Emissions:

<input checked="" type="checkbox"/> 3104C	EMCO	Biconnical Antenna	Equipment No.: ME5-810
Last Calibration Date: 03-16-01	Calibration Due Date: 03-16-02		
<input checked="" type="checkbox"/> 3146	EMCO	Log Periodic Antenna	Equipment No.: ME5-811
Last Calibration Date: 03-07-01	Calibration Due Date: 03-07-02		
<input checked="" type="checkbox"/> 6507	EMCO	Active Loop Antenna	Equipment No.:ME5A-288
Last Calibration Date: 02-01-01	Calibration Due Date: 02-01-02		



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Hafele
Locker Lock/Access Controller
6 Vdc Battery Operated
Proj:01ME10760 File: NC4085
Tested By: GB Blue=H Green=V

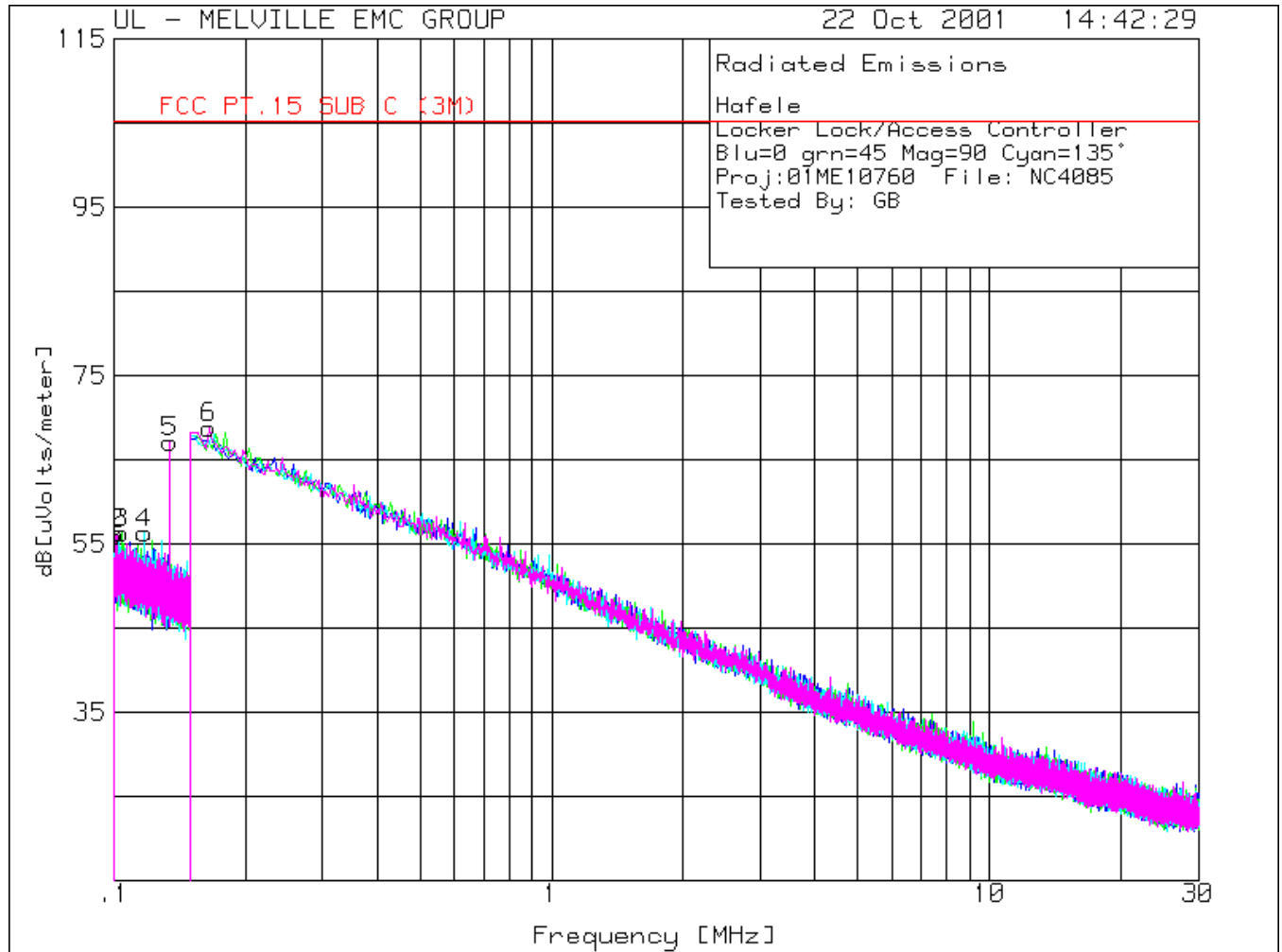
No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
1	41.5089	8.7 pk	.9	12.7	22.3	40	N/A	N/A	N/A
	Azimuth: 89	Height:99	Vert	Margin	[dB]	-17.7	N/A	N/A	N/A
2	55.1836	8.9 pk	1.1	12.2	22.2	40	N/A	N/A	N/A
	Azimuth: 215	Height:99	Vert	Margin	[dB]	-17.8	N/A	N/A	N/A
3	66.2253	11.7 pk	1.1	9.8	22.6	40	N/A	N/A	N/A
	Azimuth: 11	Height:99	Vert	Margin	[dB]	-17.4	N/A	N/A	N/A
4	308.9759	8.1 pk	2.4	16.3	26.8	46	N/A	N/A	N/A
	Azimuth: 325	Height:201	Horz	Margin	[dB]	-19.2	N/A	N/A	N/A
5	501.3489	13.4 pk	3.5	18.2	35.1	46	N/A	N/A	N/A
	Azimuth: 1	Height:97	Horz	Margin	[dB]	-10.9	N/A	N/A	N/A
6	601.3988	11.4 pk	3.7	19.4	34.5	46	N/A	N/A	N/A
	Azimuth: 358	Height:97	Horz	Margin	[dB]	-11.5	N/A	N/A	N/A

LIMIT 1: FCC Part 15 Subpart B ClB (3M)
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector
tm - Trace Math Result



Radiated Emissions Test 30 – 1000MHz



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Hafele
Locker Lock/Access Controller
Blu=0 grn=45 Mag=90 Cyan=135°
Proj:01ME10760 File: NC4085
Tested By: GB

Test No.	Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level Limit:1	2	3	4
dB[uVolts/meter]								
1	.10069	39.5 pk	.1	16.4	56	105.1	N/A	N/A
Azimuth: 174		Height:170	Horz	Margin	[dB]	-49.1	N/A	N/A
2	.10153	39.7 pk	.1	16.4	56.2	105.1	N/A	N/A
Azimuth: 0		Height:170	Horz	Margin	[dB]	-48.9	N/A	N/A
3	.10427	39.8 pk	.1	16.4	56.3	105.1	N/A	N/A
Azimuth: 0		Height:125	Horz	Margin	[dB]	-48.8	N/A	N/A
4	.11758	39.9 pk	.1	16.3	56.3	105.1	N/A	N/A
Azimuth: 0		Height:149	Horz	Margin	[dB]	-48.8	N/A	N/A
5	.13424	50.9 pk	.1	16.1	67.1	105.1	N/A	N/A
Azimuth: 185		Height:170	Horz	Margin	[dB]	-38	N/A	N/A
6	.16491	52.8 pk	.1	15.9	68.8	105.1	N/A	N/A
Azimuth: 0		Height:170	Horz	Margin	[dB]	-36.3	N/A	N/A

LIMIT 1: FCC PT.15 SUB C (3M)
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector
tm - Trace Math Result

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Hafele
Locker Lock/Access Controller
Blu=0 grn=45 Mag=90 Cyan=135°
Proj:01ME10760 File: NC4085
Tested By: GB

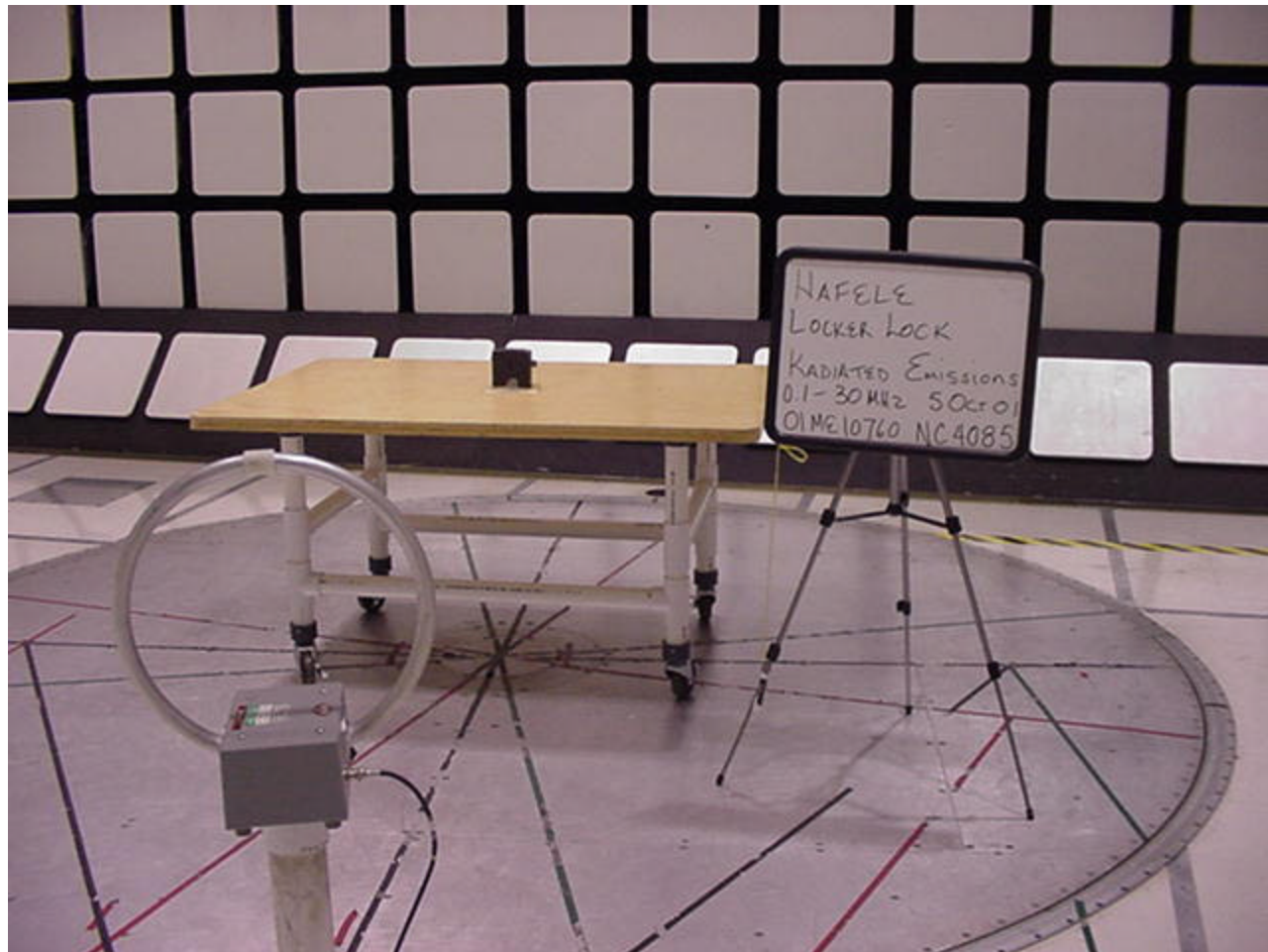
Test	Meter	Gain/Loss	Transducer	Level	Limit:1	2	3	4
Frequency	Reading	Factor	Factor	dB[uVolts/meter]				
[MHz]	[dB(uV)]	[dB]	[dB]					
=====								
.1342	44.2 av	.1	16.1	60.4	105.1	N/A	N/A	N/A
Azimuth: 44		Height:109 Horz		Margin [dB]	-44.7	N/A	N/A	N/A

LIMIT 1: FCC PT.15 SUB C (3M)
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Spectrum Analyzer Settings:

Frequency Span = 0Hz, Resolution Bandwidth = 100kHz, Video Bandwidth = 10Hz



Radiated Emissions Test 0.1 – 30MHz

3.0 Sample Calculations

Radiated Emissions Limit conversion from $\mu\text{V/m}$ to $\text{dB}\mu\text{V/m}$
(Limits in accordance with paragraph 15.109)

Radiated Emissions Limit ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log(\mu\text{V/m})$

Radiated Emissions Limit ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log(90)$

Radiated Emissions Limit ($\text{dB}\mu\text{V/m}$) = 39.1

Radiated Emissions test data obtained during measurements.

Field Strength ($\text{dB}\mu\text{V/m}$) = Measured field strength ($\text{dB}\mu\text{V/m}$) + Antenna Factor (dB) + Cable Factor (dB)

Field Strength ($\text{dB}\mu\text{V/m}$) = $19.7\text{dB}\mu\text{V/m} + 12.5\text{dB} + 0.3\text{dB}$

Field Strength ($\text{dB}\mu\text{V/m}$) = 32.5

Radiated Emissions Limit conversion from $\mu\text{V/m}$ to $\text{dB}\mu\text{V/m}$ and 40dB/decade
(Limits in accordance with paragraph 15.209)

Radiated Emission Limits; General Requirements

Frequency between 0.009-0.490 MHz,

$2400/F(\text{kHz})$ at 300 meters = Field Strength in $\mu\text{V/meter}$

Fundamental Frequency=134kHz

$2400/(134)$ at 300 meters

Radiated emissions at 134 kHz at 300 meters = $17.9\mu\text{V/meter}$

$\text{dB}\mu\text{V/m} = 20 \cdot \log(17.9\mu\text{V/m})$

$\text{dB}\mu\text{V/m} = 25.05$ at 300meters

Add 40dB/decade

300 meters to 3 meters = 80 dB

Radiated Emissions Limit = $\text{dB}\mu\text{V/m} + \text{dB}$

$25.05 + 80$

105.05 $\text{dB}\mu\text{V/m}$

Magnetic field conversion of the active loop antenna:

The magnetic field reading was converted to an electrical field reading by adding the Electric Antenna factors (dB) to the field strength reading. The electric antenna factors are established at the time of the antenna calibration.

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4.0 SUMMARY:

The equipment under test has

☒ met the technical requirements as defined under section(s) ☒ 2.0 and ☐ 3.0

☐ not met the technical requirements as defined under section(s) ☐ 2.0 and ☐ 3.0

Test Start Date: 10-05-01

Test Completion Date: 10-22-01

- UNDERWRITERS LABORATORIES, INC. -

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