

MEASUREMENT AND TECHNICAL REPORT

DIRECTED ELECTRONICS
1 Viper Way
Vista, CA 92083

DATE: 12 June 2003

This Report Concerns:	Original Grant: <input checked="" type="checkbox"/>	Class II Change: <input type="checkbox"/>
Equipment Type:	Responder one way companion remote, Model 472	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: <input type="checkbox"/> Defer until: <input type="text"/>	No: <input checked="" type="checkbox"/>
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.	<input type="text" value="N/A"/>	
Transition Rules Request per 15.37?	Yes: <input type="checkbox"/>	No: <input checked="" type="checkbox"/>
(*) FCC Part 15, Paragraph(s) 15.231(a), 15.231(b), 15.231(c)		
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 -- NOTE: This information will be input into your test report as shown below.

EUT Description: Keyfob transmitter

EUT Name: Responder on way companion remote

Model No.: 472 Serial No.: --

Product Options: --

Configurations to be tested: --

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: 3V (CR2032 lithium battery) (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: --

Current (Amps/phase(max)): -- Current (Amps/phase(nominal)): --

Other: --

Other Special Requirements

--

Typical Installation and/or Operating Environment

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

Automotive

EUT Power Cable

Permanent OR Removable Length (in meters): --

Shielded OR Unshielded

Not Applicable

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	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
--	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>

EUT Software.

Revision Level: --

Description: --

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. Continuous transmission with typical modulation

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 #
--			

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

Description	Model #	Serial #	FCC #
--			

Oscillator Frequencies			
Frequency	Derived Frequency	Component # / Location	Description of Use
433.92 MHz	--	--	RF Carrier frequency

Power Supply			
Manufacturer	Model #	Serial #	Type
--			<input type="checkbox"/> Switched-mode (Frequency) <input type="checkbox"/> Linear <input type="checkbox"/> Other

Power Line Filters		
Manufacturer	Model #	Location in EUT
--		

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.

--

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
Deactivation	15.231(a)	Pass
Field Strength of Emissions	15.231(b)	Pass
Emissions Bandwidth	15.231(c)	Pass
Duty Cycle Measurements	ANSI C63.4, Appendix 14, Para. 10	Pass

Both Conducted and Radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 25 GHz).

1.5 Test Facility

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

TÜV AMERICA, INC
 10040 Mesa Rim Road
 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

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

Report No. SC302492-03

**3.0 DEACTIVATION EQUIPMENT/DATA
FIELD STRENGTH OF EMISSIONS EQUIPMENT/DATA
EMISSION BANDWIDTH EQUIPMENT/DATA
DUTY CYCLE EQUIPMENT/DATA**

See following page(s).

Test Conditions: DEACTIVATION: FCC Part 15.231(a)
FIELD STRENGTH OF EMISSIONS: FCC Part 15.231(b)
EMISSION BANDWIDTH: FCC Part 15.231(c)
DUTY CYCLE: ANSI C63.4, Appendix 14, Para. 10

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

- Test not applicable

- - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber
- - Roof (Small Open Area Test Site)

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
SR3					
CBL6111	460	Bilog Antenna	Chase Electronics	1013	NCR*
3115	453	Horn Antenna	EMCO	9412-4364	01/03
8566B	407	Spectrum Analyzer	Hewlett Packard	2311A02209	05/03
Roof					
3115	251	Horn Antenna	EMCO	2495	12/02
3146	244	Log Periodic Antenna	EMCO	1063	06/02
8566B	720	Spectrum Analyzer	Hewlett Packard	2115A00842	09/02
AMF-5D-010180-35-10P	719	Preamplifier	Miteq	549460	NCR*

Notes:

15.209, 15.109 - Radiated Emissions

SR3 - Prescan provided no emissions from 30 MHz to 4.5 GHz to instigate other than fundamental and harmonics.
 Equipment: 460, 453, 407

15.231(a) - Deactivation

SR3 - EUT shuts off RF emission as button is released.
 Equipment: 460, 407

15.231(b) - Field Strength of Emissions

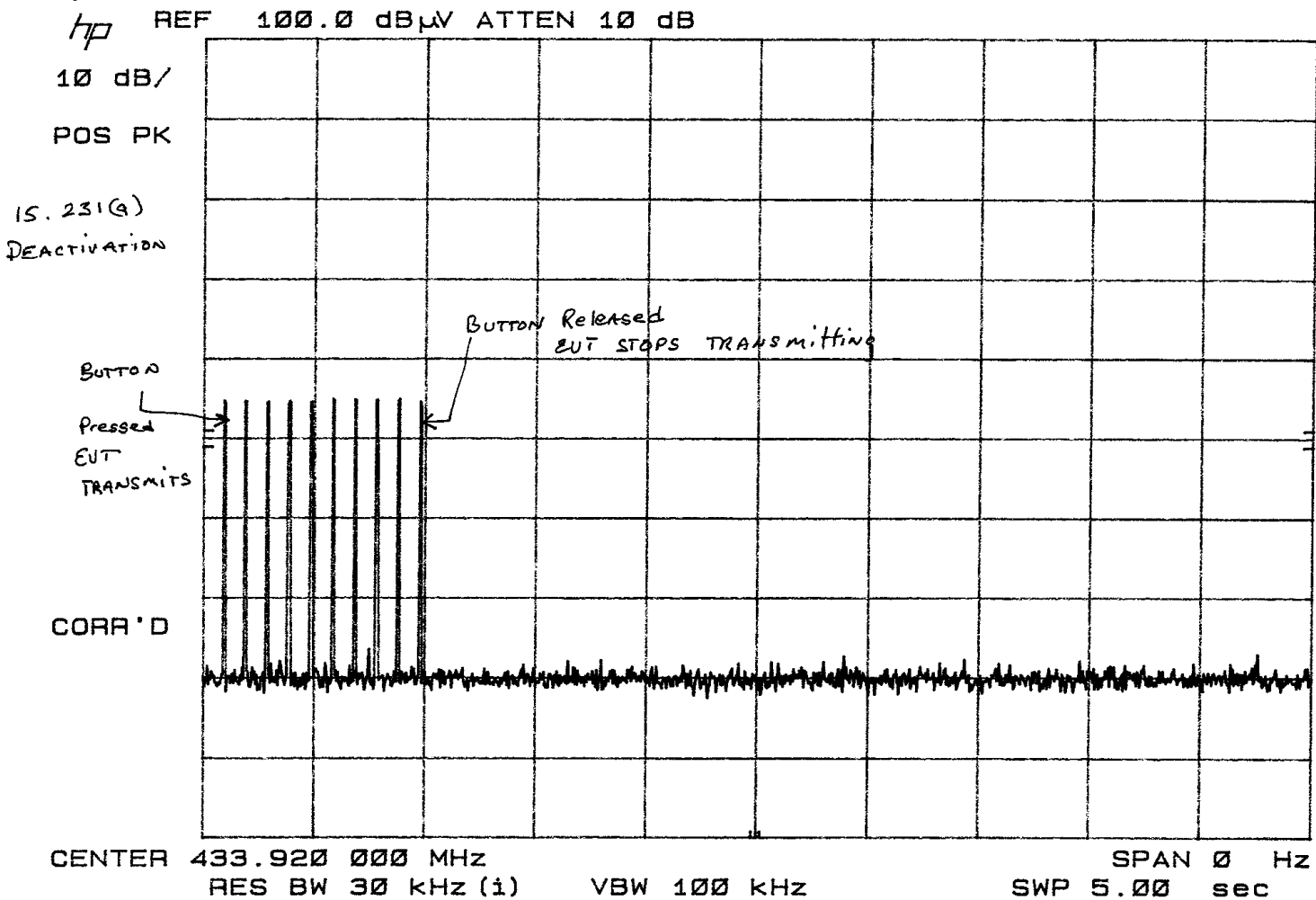
SR3 - Duty Cycle: $\frac{7.4 \text{ ms}}{100 \text{ ms}} = .074$, therefore 10% used.
 Equipment: 460, 407, 251, 244, 720, 719

15.231(c) - Emission Bandwidth

SR3 - 0.25% of f = limit
 0.25% of 433.9 = 1080 kHz
 Measured 148 kHz
 148 kHz < 1080 kHz, therefore EUT complies.
 Equipment: 460, 407

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

SC 302492 Directed Electronics 472 Keyfob Transmitter
LOCATION: TUV SR3
MAY 30, 2003
ENGR: A. Laudani *A. Laudani* FCC 15.231(a)
DEACTIVATION



REPORT No: SC302492 TESTER: Alan Laudani *ML* SPEC: FCC Part 15 para 15.231(b)
 FCC Part 15.205
 CUSTOMER: Directed Electronics Inc. TEST DIST: 3 Meters
 E U T: 472 Keyfob Transmitter TEST SITE: Roof
 EUT MODE: Transmit, continuous BICONICAL: N/A
 DATE: May 30, 2003 LOG: 244
 NOTES: Duty Cycle= 10% $\geq \frac{7.4^{NS}}{100 \text{ ms}} \times 100\%$ OTHER: 251
 above 1GHz: RBW & VBW 1 MHz for Pk; AVG = PK - 20LOG(Duty Cycle)
 below 1GHz: RBW & VBW 100 kHz for Pk; AVG = PK - 20LOG(Duty Cycle)
 CF = Antenna Factor + Cable Loss - Preamp Gain (preamp > 1 GHz)

v.beta231

FREQ (MHz)	VERT. (dBuv)		HORIZ (dBuv)		CF (dB/m)	MAX LEVEL (dBuV/m)		SPEC LIMIT (dBuV/m)		MARGIN (dB)		EUT Rotation	Antenna Height	Notes
	pk	DCav	pk	DCav		pk	av	pk	av	pk	av			
433.920	69.9	49.9	77.5	57.5	16.4	93.9	73.9	100.8	80.8	-6.9	-6.9	315	1	
867.840	39.5	19.5	36.4	16.4	22.7	62.2	42.2	80.8	60.8	-18.6	-18.6			ambient
1301.760	39.8	19.8	51.1	31.1	-11.8	39.3	19.3	74.0	54.0	-34.7	-34.7	239	1.6	
1735.680	57.6	37.6	64.6	44.6	-8.7	55.9	35.9	80.8	60.8	-24.9	-24.9	191	1	
2169.600	58.1	38.1	62.8	42.8	-6.0	56.8	36.8	80.8	60.8	-24.0	-24.0	201	1.1	
2603.520	59.6	39.6	57.3	37.3	-4.1	55.5	35.5	80.8	60.8	-25.4	-25.4	180	1	
3037.440	62.8	42.8	61.9	41.9	-2.7	60.1	40.1	80.8	60.8	-20.7	-20.7	180	1.1	
3471.360	53.9	33.9	50.5	30.5	-1.1	52.8	32.8	80.8	60.8	-28.0	-28.0	5	1.1	
3905.280	53.2	33.2	56.2	36.2	0.1	56.3	36.3	74.0	54.0	-17.7	-17.7	300	1.2	
4339.200	51.0	31.0	54.1	34.1	-0.3	53.8	33.8	74.0	54.0	-20.2	-20.2	140.1	1	

SC302492 Directed Electronics 472 KeyFob Transmitter

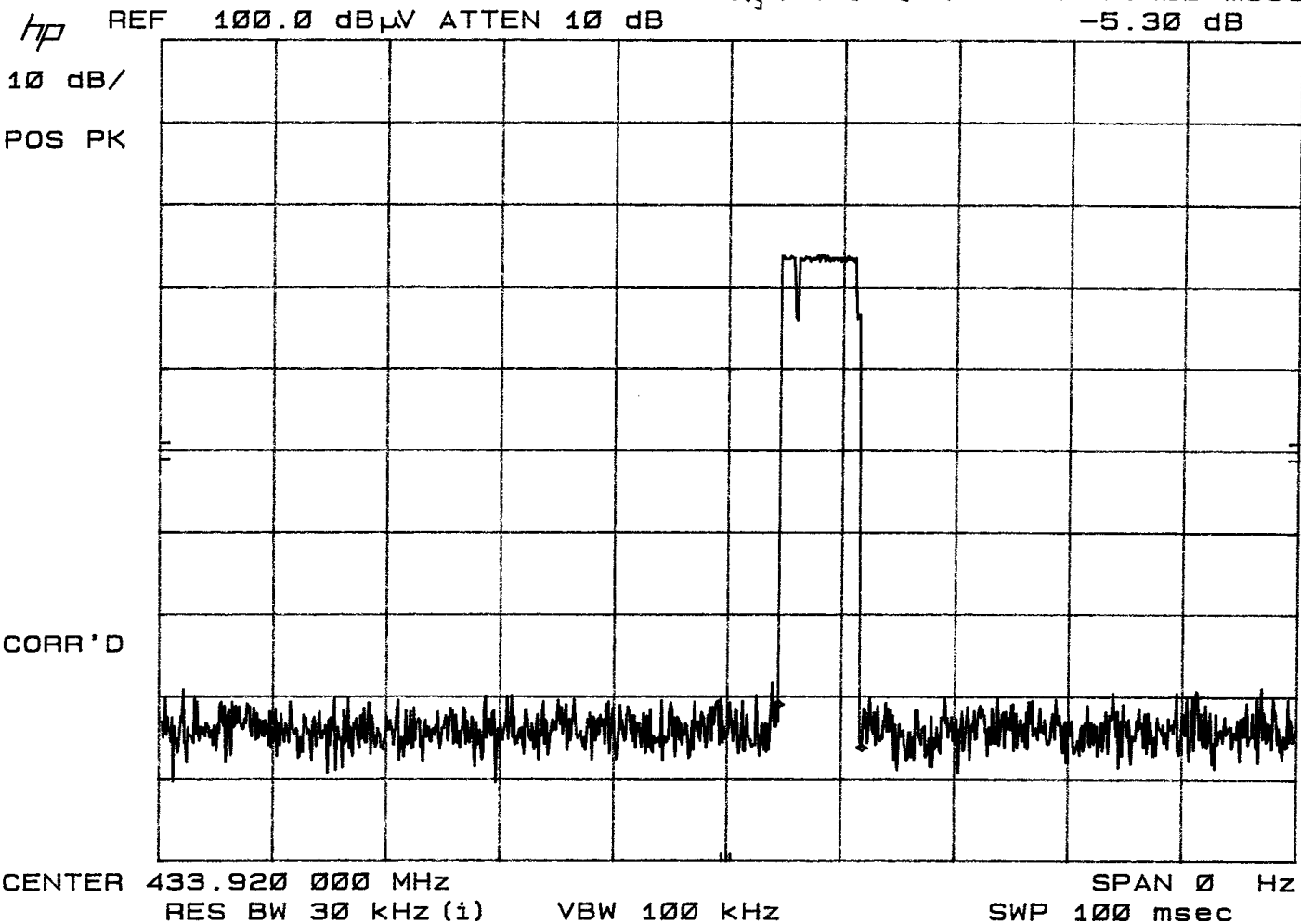
LOCATION TUV SR3

MAX 30, 2003

Engr. A. Landoni

DUTY CYCLE 10% $\geq \frac{7.4 \text{ ms}}{100 \text{ ms}} \times 100\%$

15.231 (b) Field Strength of EMISSION MKR $\Delta 7.400 \text{ msec}$
 -5.30 dB



SC 302492 Directed Electronics 472 Key fob transmitter
LOCATION: TUV SR3

MAY 30, 2003

ENGR: L. Landon: A. Landon

FCC 15.231 (c)

EMISSION BANDWIDTH

MKR Δ 148 KHZ
-0.10 dB

HP REF 100.0 dB μ V ATTEN 10 dB

10 dB/

POS PK

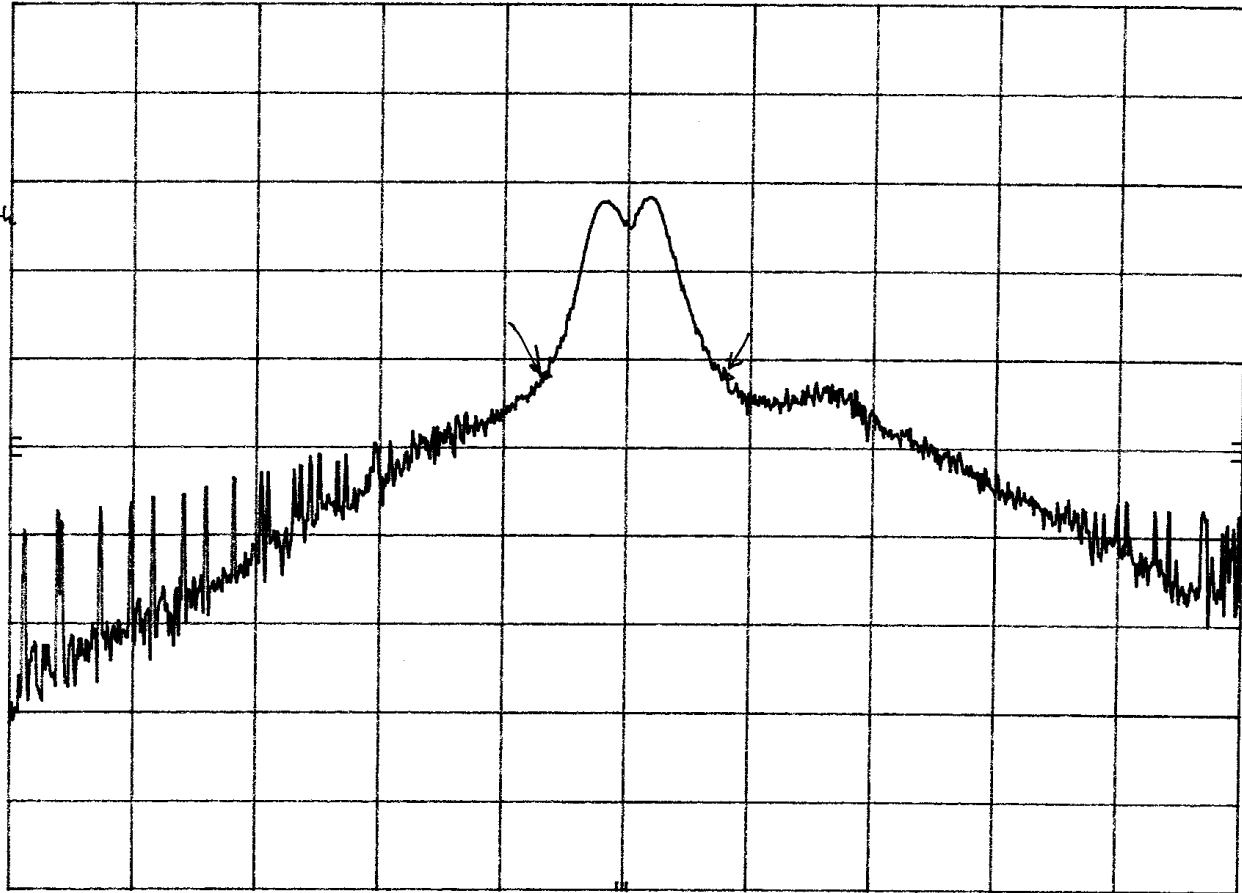
15.231 (c)
EMISSION BANDWIDTH

EUT
COMPLIES:

148 KHZ Δ
1080 KHZ

Limit:
1080 KHZ =
0.25% f
433.9 MHz

CORR'D



CENTER 433.92 MHz

RES BW 30 KHZ (i)

VBW 100 KHZ

SPAN 1.00 MHz

SWP 20.0 msec

Report No. SC302492-03

4.0 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests were performed per CFR 47, Part(s) 15.231(a), 15.231(b), 15.231(c)

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) 15.231(a), 15.231(b), 15.231(c)

Testing Start Date: 30 May 2003

Testing End Date: 30 May 2003

- TÜV AMERICA, INC. -

Responsible Engineer:



Jim Owen
(EMC Chief Engineer)

Responsible Engineer:



Alan Laudani
(EMC Engineer)