

FCC CERTIFICATION TEST REPORT

for

AutoVision Enterprises, Inc.
8126 US Highway 98 N
Lakeland, FL 33809

FCC ID: OR2AVTRANSTR101

June 20, 2000

WLL PROJECT #: 5583X

This report may not be reproduced, except in full, without the prior written consent of Washington Laboratories, Ltd.

TABLE OF CONTENTS

Letter of Agency

Statement of Qualifications

1.0	INTRODUCTION	2
1.1	SUMMARY.....	2
2.0	DESCRIPTION OF EQUIPMENT UNDER TEST (EUT).....	2
2.1	ON-BOARD OSCILLATORS.....	2
3.0	TEST CONFIGURATION.....	3
3.1	TESTING ALGORITHM	3
3.2	CONDUCTED EMISSIONS TESTING	3
3.3	RADIATED EMISSIONS TESTING	3
3.3.1	<i>Radiated Data Reduction and Reporting</i>	3
	FCC 15.239 3M Radiated Emissions Data – Site 2	5
	FCC 15.239 3M Radiated Emissions Data – Site 2	7
	FCC 15.239 3M Radiated Emissions Data – Site 2	8
	FCC 15.239 3M Radiated Emissions Data – Site 2	9
	FCC 15.239 3M Radiated Emissions Data – Site 2	10

TABLES

Table 1.	Radiated Emissions Results
Table 2.	System Under Test
Table 3.	Interface Cables Used
Table 4.	Measurement Equipment Used

APPENDICES

Appendix A.	Statement of Measurement Uncertainty
Appendix B.	Modifications

AutoCinema™

with Sound-A-Round®

Chief, Authorizations Branch
Federal Communications Commission
7435 Oakland Mills Road
Columbia, MD. 21046

RE: LETTER OF AGENCY

This letter is to serve notice that Washington Laboratories, Ltd. Is hereby authorized to act on our behalf in connection with the Application for Equipment Authorization attached herewith.

We certify that we are not subject to denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse ACT of 1998, U.S.C. 862. Further, no party, as defined in 47 CFR 1.2002(b), to the application is subject to denial of federal benefits, that includes FCC benefits.

Signed,



Christopher J. Vittito

President

8126 US Hwy 98 North • Lakeland, FL 33809-5325 • Toll Free: 1-800-229-3909
Office: (941) 815-2999 • Fax (941) 815-2998 • Web Site: www.autocinema.com

AutoVision Enterprises, Inc.
FCC ID: OR2AVTRANSTR101
WLL Project #: 5583X Amendment

FCC CERTIFICATION TEST REPORT

for

FCC ID: OR2AVTRANSTR101

1.0 Introduction

This report has been prepared on behalf of AutoVision Enterprises, Inc. to amend a previously submitted Application for Equipment Authorization. The test and application are submitted for an Intentional Radiator under Part 15.239 of the FCC Rules and Regulations. The Equipment Under Test was a FM Transmitter which operates from 88.1 MHz to 89.5MHz, inclusive.

The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and field Strength Instrumentation. Calibration checks are made periodically to verify proper performance of the measuring instrumentation.

All measurements are performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ± 2.3 dB. Refer to Appendix A for Statement of Measurement Uncertainty. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government.

1.1 Summary

After the implementation of the modification listed in Appendix B, the AutoVision Enterprises, Inc. FM Transmitter complies with the limits for an Intentional Radiator under Part 15.239 of the FCC Rules and Regulations.

2.0 Description of Equipment Under Test (EUT)

The AutoVision Enterprises, Inc. transmitter (EUT) is an FM transmitter used for transmitting audio from a VCR/TV to a vehicle radio so that the audio may be heard over the automobile speakers. The unit transmits at the following frequencies programmed at the time of installation:

- 100kHz increments from 88.1-89.6, inclusive

2.1 On-board Oscillators

The AutoVision Enterprises, Inc. transmitter contains a 16MHz oscillator:

3.0 Test Configuration

Under agreement with the FCC, the EUT was tested in 3 different vehicles as listed below:

1. Ford Expedition SUV
2. Chevy Suburban Jumbo SUV with Sun/Moon Roof
3. Dodge Caravan Mini Van

The EUT was installed in the normal fashion in the overhead compartment for each vehicle. The EUT was connected to a VCR system and powered from the 12V vehicle battery system.

There are two connections for audio input on the EUT:

<u>I/O Ports</u>	<u>I/O Cables</u>
Audio Input L	RCA 2m, Audio In Left
Audio Input R	RCA 2m, Audio In Right

3.1 Testing Algorithm

Two frequencies were examined: 88.1 MHz and 89.5 MHz. Data for all positions, orientations and antenna polarizations were collected at a transmit frequency of 88.1 MHz. All frequencies at the worst-case azimuths were measured with the unit set to a transmit frequency of 89.5 MHz. The band edge at 88MHz was also measured at the worst case azimuth to show compliance with the limits of 15.209.

Data were collected to the 10th harmonic of the transmitter fundamental.

Worst case emissions are recorded in the data tables, with data with 6 dB of the limit presented in the tables.

3.2 Conducted Emissions Testing

Conducted emissions testing was not performed as the unit is DC powered.

3.3 Radiated Emissions Testing

The transmitter was installed in the auto under test (AUT), turned on and constantly transmitting. The AUT was set up on an open area test site. The measurement antenna was mounted on an antenna mast and positioned at 22.5° radials at a distance of 3 meters from the perimeter of the vehicle. Horizontal and vertical polarities were tested and the antenna height was scanned from 1 to 4 meters.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak or peak, as appropriate.

At the fundamental frequency, an average measurement was performed. This measurement was collected by setting the resolution bandwidth of the spectrum analyzer to 100kHz and the video bandwidth set to 10 Hz. The detector function was set to peak.

At the spurious emission frequencies, the measurement bandwidth on the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth and the detector function set to quasi-peak.

3.3.1 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are grouped into a composite antenna factor (AFc) and are supplied in the AFc column of Table 1. The AFc in dB/m is algebraically added to the Spectrum Analyzer Voltage in dB μ V to obtain the Radiated Electric Field in dB μ V/m. This level is then compared with the FCC limit.

Example:

Spectrum Analyzer Voltage: $V_dB\mu V$

Composite Antenna Factor: $AF_c dB/m$

Electric Field: $EdB\mu V/m = V_dB\mu V + AF_c dB/m$

To convert to linear units: $E\mu V/m = \text{antilog}(EdB\mu V/m/20)$

Worst case emissions data are recorded in Table 1.

The data that are presented represent the emissions measured at any azimuth that are within 6 dB of the FCC Limit.

Table 1A
FCC 15.239 3M Radiated Emissions Data – Site 2

CLIENT: Auto Vision
 MODEL NO: 88 MHz transmitter
 DATE: 5/8/00
 FREQUENCY 88.1 & 89.5 MHz
 BY: Mike Violette
 JOB #: 5725

CONFIGURATION	
:	FORD Expedition

FREQ MHz	POL H/V	Azimuth Degree	Ant Height m	SA LEVEL dBuV	AFc dB/m	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MARGIN dB
Transmit: 88.1 MHz									
88.00	H	112.5	4.0	21.0	10.6	31.6	37.9	100.0	-8.4
88.00	V	90.0	1.5	21.5	10.6	32.1	40.1	100.0	-7.9
88.10	H	45.0	4.0	32.2	10.6	42.8	137.8	250.0	-5.2
88.10	V	45.0	2.0	31.6	10.6	42.2	128.6	250.0	-5.8
88.10	V	67.5	2.0	35.5	10.6	46.1	201.5	250.0	-1.9
88.10	H	67.5	4.0	33.1	10.6	43.7	152.9	250.0	-4.3
88.10	V	90.0	2.0	36.2	10.6	46.8	218.4	250.0	-1.2
88.10	H	90.0	2.0	32.2	10.6	42.8	137.8	250.0	-5.2
264.30	V	90.0	1.5	25.5	14.9	40.4	104.7	200.0	-5.6
88.10	V	112.5	4.0	31.8	10.6	42.4	131.6	250.0	-5.6
264.30	H	112.5	2.5	25.2	14.9	40.1	101.2	200.0	-5.9
792.40	H	112.5	2.5	16.9	27.1	44.0	158.9	200.0	-2.0
792.40	V	112.5	2.0	14.1	27.1	41.2	115.1	200.0	-4.8
792.40	V	135.0	2.0	14.9	27.1	42.0	126.2	200.0	-4.0
792.40	H	135.0	2.5	13.2	27.1	40.3	103.8	200.0	-5.7
88.10	H	225.0	4.0	32.4	10.6	43.0	141.0	250.0	-5.0
88.10	V	225.0	2.0	32.0	10.6	42.6	134.7	250.0	-5.4
88.10	V	247.5	2.0	32.0	10.6	42.6	134.7	250.0	-5.4
88.10	H	247.5	4.0	31.8	10.6	42.4	131.6	250.0	-5.6
88.10	H	292.5	4.0	31.3	10.6	41.9	124.3	250.0	-6.1
264.30	V	292.5	1.0	25.4	14.9	40.3	103.5	200.0	-5.7
88.10	H	315.0	4.0	33.2	10.6	43.8	154.6	250.0	-4.2
792.40	V	337.5	1.0	15.1	27.1	42.2	129.1	200.0	-3.8
792.40	H	337.5	1.0	14.7	27.1	41.8	123.3	200.0	-4.2

AutoVision Enterprises, Inc.
FCC ID: OR2AVTRANSTR101
WLL Project #: 5583X Amendment

***AutoVision Enterprises, Inc.
FCC ID: OR2AVTRANSTR101
WLL Project #: 5583X Amendment***

Table 1A (continued)
FCC 15.239 3M Radiated Emissions Data – Site 2

CLIENT: Auto Vision
 MODEL NO: 88 MHz transmitter
 DATE: 5/8/00
 FREQUENCY 88.1 & 89.5 MHz
 BY: Mike Violette
 JOB #: 5725

CONFIGURATION
 : FORD Expedition

FREQ MHz	POL H/V	Azimuth Degree	Ant Height m	SA LEVEL dBuV	AFc dB/m	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MARGIN dB
Transmit: 89.5 MHz									
89.50	V	90.0	1.0	35.4	10.8	46.2	205.1	250.0	-1.7
89.50	H	90.0	2.5	28.8	10.8	39.6	95.9	250.0	-8.3
626.50	V	90.0	1.5	11.3	24.0	35.3	58.5	200.0	-10.7
805.50	V	90.0	1.0	15.7	27.2	42.9	139.6	200.0	-3.1
805.50	H	90.0	1.0	13.8	27.2	41.0	112.2	200.0	-5.0
89.50	V	112.5	2.5	33.2	10.8	44.0	159.2	250.0	-3.9
89.50	H	112.5	2.5	28.8	10.8	39.6	95.9	250.0	-8.3
268.50	V	112.5	2.0	23.4	15.0	38.4	83.6	200.0	-7.6
805.50	V	112.5	1.0	16.0	27.2	43.2	144.5	200.0	-2.8
805.50	H	112.5	1.0	13.8	27.2	41.0	112.2	200.0	-5.0

Table 1B
FCC 15.239 3M Radiated Emissions Data – Site 2

CLIENT: Auto Vision
 MODEL NO: 88 MHz transmitter (TR101)
 DATE: 6/9/00
 FREQUENCIES: 88.1 & 89.5 MHz
 BY: Greg Snyder
 JOB #: 5725

CONFIGURATION:		CHEVY Suburban with Moon Roof							
FREQ MHz	POL H/V	Azimuth Degree	Ant Height m	SA LEVEL (QP) dBuV	AFc dB/m	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MARGIN dB
Transmit: 88.1 MHz									
88.00	H	292.50	4.0	21.1	10.6	31.7	38.3	100.0	-8.3
88.00	V	337.50	1.5	19.8	10.6	30.4	33.0	100.0	-9.6
88.10	H	67.50	4.0	31.6	10.6	42.2	128.6	250.0	-5.8
88.10	H	90.00	4.0	31.1	10.6	41.7	121.4	250.0	-6.3
88.10	H	202.50	4.0	32.5	10.6	43.1	142.7	250.0	-4.9
88.10	H	225.00	4.0	35.3	10.6	45.9	196.9	250.0	-2.1
88.10	V	247.50	2.0	32.9	10.6	43.5	149.4	250.0	-4.5
792.90	V	247.50	1.5	12.3	27.1	39.4	93.6	200.0	-6.6
88.10	V	270.00	4.0	31.0	10.6	41.6	120.0	250.0	-6.4
88.10	H	292.50	4.0	35.9	10.6	46.5	211.0	250.0	-1.5
88.10	V	292.50	1.0	32.3	10.6	42.9	139.4	250.0	-5.1
88.10	V	337.50	1.0	34.3	10.6	44.9	175.5	250.0	-3.1
88.10	H	337.50	4.0	30.5	10.6	41.1	113.3	250.0	-6.9
Transmit: 89.5 MHz									
89.50	V	292.50	1.0	34.1	10.8	44.9	176.6	250.0	-3.0
89.50	H	292.50	4.0	31.2	10.8	42.0	126.5	250.0	-5.9
89.50	H	225.00	4.0	29.8	10.8	40.6	107.6	250.0	-7.3
89.50	V	225.00	4.0	29.1	10.8	39.9	99.3	250.0	-8.0

Table 1C
FCC 15.239 3M Radiated Emissions Data – Site 2

CLIENT: Auto Vision
 MODEL NO: 88 MHz transmitter (TR101)
 DATE: 5/9/00
 FREQUENCIES 88.1 & 89.5 MHz
 BY: Chad M. Beattie
 JOB #: 5725

CONFIGURATION: DODGE Caravan

FREQ MHz	POL H/V	Azimuth Degree	Ant Height m	SA LEVEL (QP) dBuV	AFc dB/m	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MARGIN dB
Transmit: 88.1 MHz									
88.00	H	67.50	4.0	20.8	10.6	31.4	37.0	100	-8.6
88.00	V	337.50	1.0	20.1	10.6	30.7	34.2	100	-9.3
88.10	V	0.00	4.0	33.2	10.6	43.8	154.6	250	-4.2
792.40	V	0.00	1.0	14.1	27.1	41.2	115.1	200	-4.8
88.10	V	22.50	2.0	32.6	10.6	43.2	144.3	250	-4.8
88.10	H	22.50	4.0	31.0	10.6	41.6	120.0	250	-6.4
88.10	V	45.00	1.0	31.0	10.6	41.6	120.0	250	-6.4
792.90	V	45.00	1.0	17.2	27.1	44.3	164.6	200	-1.7
88.10	H	67.50	4.0	37.0	10.6	47.6	239.5	250	-0.4
88.10	V	67.50	1.0	35.0	10.6	45.6	190.3	250	-2.4
88.10	H	67.50	4.0	31.9	10.6	42.5	133.2	250	-5.5
88.10	V	90.00	1.0	32.1	10.6	42.7	136.3	250	-5.3
88.10	H	90.00	4.0	31.0	10.6	41.6	120.0	250	-6.4
88.10	H	112.50	4.0	32.2	10.6	42.8	137.8	250	-5.2
792.90	V	135.00	2.0	14.4	27.1	41.5	119.3	200	-4.5
88.10	H	225.00	4.0	31.3	10.6	41.9	124.3	250	-6.1
792.90	V	225.00	1.5	14.1	27.1	41.2	115.2	200	-4.8
792.90	H	225.00	1.8	14.0	27.1	41.1	113.9	200	-4.9
88.10	V	247.50	2.0	31.7	10.6	42.3	130.1	250	-5.7
792.90	V	247.50	1.5	15.4	27.1	42.5	133.8	200	-3.5
792.90	H	247.50	2.5	13.8	27.1	40.9	111.3	200	-5.1
88.10	V	270.00	4.0	32.1	10.6	42.7	136.3	250	-5.3
88.10	V	315.00	4.0	31.4	10.6	42.0	125.7	250	-6.0
88.10	V	337.50	1.0	34.3	10.6	44.9	175.5	250	-3.1

Table 1C (continued)
 FCC 15.239 3M Radiated Emissions Data – Site 2

CLIENT: Auto Vision
MODEL NO: 88 MHz transmitter (TR101)
DATE: 5/9/00
FREQUENCIES 88.1 & 89.5 MHz
BY: Chad M. Beattie
JOB #: 5725

CONFIGURATION: DODGE Caravan

FREQ MHz	POL H/V	Azimuth Degree	Ant Height m	SA LEVEL (QP) dBuV	AFc dB/m	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MARGIN dB
Transmit: 89.5 MHz									
89.50	V	45.00	4.0	32.8	10.8	43.6	152.1	250	-4.3
89.50	H	45.00	1.0	30.9	10.8	41.7	122.2	250	-6.2
805.50	H	45.00	1.0	14.1	27.2	41.3	116.1	200	-4.7
805.50	V	45.00	1.0	10.6	27.2	37.8	77.6	200	-8.2
89.50	V	337.50	3.0	34.1	10.8	44.9	176.6	250	-3.0
89.50	H	337.50	4.0	29.8	10.8	40.6	107.6	250	-7.3
805.50	V	337.50	1.0	12.1	27.2	39.3	92.3	200	-6.7

Table 2

System Under Test

FCC ID: OR2AVTRANSTR101

EUT: AutoVision Enterprises, Inc. RF Transmitter; M/N: 88.1-89.5 MHz RF Transmitter; S/N: N/A; FCC ID: OR2AVTRANSTR101

Table 3

Interface Cables Used

RCA Cables were used to provide Left and Right audio input.

The EUT was powered via a non-shielded DC power cord.

Table 4

Measurement Equipment Used

The following equipment is used to perform measurements:

Hewlett-Packard Spectrum Analyzer: HP8564E
Hewlett-Packard Spectrum Analyzer: HP8568B
Hewlett-Packard Spectrum Analyzer: HP8593A
Hewlett-Packard Quasi-Peak Adapter: HP85650A
Hewlett-Packard Preselector: HP85685A
Hewlett-Packard Preamplifier: HP8449B
Antenna Research Associates, Inc. Biconical Log Periodic Antenna: LPB-2520A (Site 2)
Antenna Research Associates, Inc. Horn Antenna: DRG-118/A
Solar 50 Ω/50 µH Line Impedance Stabilization Network: 8012-50-R-24-BNC
Solar 50 Ω/50 µH Line Impedance Stabilization Network: 8028-50-TS-24-BNC
AH Systems, Inc. Portable Antenna Mast: AMS-4 (Site 2)
AH Systems, Inc. Motorized Turntable (Site 2)
RG-214 semi-rigid coaxial cable
RG-223 double-shielded coaxial cable

Appendix A

Statement of Measurement Uncertainty

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± 2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, total Uncertainty = $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

Appendix B

Modifications

The following modifications were made, in addition to the production modifications, to the AutoVision Enterprises, Inc. RF transmitter in order for it to comply with the radiated emissions requirements:

1. The transmitting antenna was set to 8".
2. The system is installed in a metal enclosure with the shells of the RCA inputs and the outer conductor of the coaxial cable connected to the shielded enclosure.
3. Capacitor C18 was changed from 56pf to 150pf.