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A Laboratory Evaluation of Color Video Monitors

Preston L. Terry
Imaging Technologies and Systems Department
Sandia National Laboratories
Albuquerque, New Mexico, 87185

Abstract

Sandia National Laboratories has considerable experience with monochrome video monitors used in alarm assessment video systems. Most of these systems, used for perimeter protection, were designed to classify rather than to identify intruders. There is a growing interest in the identification function of security video systems for both access control and insider protection. Because color video technology is rapidly changing and because color information is useful for identification purposes, Sandia National Laboratories established a program to evaluate the newest relevant color video equipment. This report documents the evaluation of an integral component, color monitors. It briefly discusses a critical parameter, dynamic range, details test procedures, and evaluates the results.

This work was supported by the US Department of Energy under
Contract DE-AC04-DP00789.

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1.0 INTRODUCTION

Color monitors translate the electrical signal they receives from cameras into a visual image; therefore, performance is critical when used in a CCTV system. An evaluation was conducted on seven monitors to determine their dynamic range and resolution performance. Monitor selection criterion were:

- different screen sizes
- different screen sizes and different manufacturers
- different manufacturers.

2.0 MONITOR DYNAMIC RANGE EVALUATION

The dynamic range of a monitor is defined as the range of highlight luminance level that can be achieved while maintaining the complete ten step gray scale response and without any appreciative degradation in resolution. The dynamic range is important in determining the ambient light level in which the monitor can operate. Brighter screens are necessary when viewed in an environment with higher ambient light levels. The following paragraphs describe the test setup and procedures used for evaluating the monitors' dynamic range.

2.1 Test Setup

A camera was set up to view a backlit EIA resolution chart. The video output of the camera was attached to the input of a waveform monitor. The output of the waveform monitor was connected to the input of a video monitor.

2.2 Test Procedures

Initially, while viewing the resolution chart displayed by the monitor, the contrast and brightness controls were set to maximum. At this setting a horizontal resolution reading was taken, and the number of gray scale

steps reproduced by the monitor were counted. The results were tabulated along with the measured luminance intensity of the monitor. The luminance intensity of the monitors were measured in the top and bottom inner portion of the central circle of the EIA chart. One measurement was taken at the top and another at the bottom quadrant of the circle in order to get an indication of the uniformity of the intensity.

If ten steps of gray scale were discerned and if the measured resolution was equal to or better than the manufacturer specification, then no other measurements were taken. If the monitor failed to reproduce either ten gray steps or the specified resolution, then the contrast and brightness levels were adjusted to the point where the monitor best performed, and the results were tabulated. The table below gives the results of the evaluation.

2.3 Test Results

To check the resolution of color monitors the camera used should provide greater resolution. However, at the time of this evaluation there were no known color video cameras made for security applications that met that requirement. The highest resolution for the cameras was 480 horizontal television lines compared to 600 for the monitors, therefore, some of the monitors were not tested for their maximum performance. Keeping that fact in mind all of the cameras performed as expected except the Barco AVM-22H and the Panasonic CT-1400MG. Their resolution at full brightness/contrast was considerable lower than the published specifications. Also, it should be noted that the Panasonic monitor only produced eight of the ten gray scale steps.

All the monitors except the JVC VMR-190SU displayed relative luminance intensity uniformity over the entire screen.

Dynamic Range Test Results Table

MANUFACTURER AND MODEL NUMBER	Screen Size	Horizontal Resolution Specification	Horizontal Resolution Test Results	Screen Luminance Measurement in Foot Lamberts .		Number of Gray Scale Steps Displayed
				Top	Bottom	
JVC VMR-190SU	19 inches	480 TVL	480 TVL	57	34	10
SONY PVM- 1344Q	13 inches	600 TVL	*480 TVL	69	70	10
JAVELIN CVM-9	9 inches	330 TVL	320 TVL	83	80	10
BARCO AVM-22IH	10 inches	500 TVL	<200 TVL	81	85	10
BARCO AVM-22IH	10 inches	500 TVL	450 TVL	29	29	10
PANASONIC BTM-1310Y	13 inches	550 TVL	*470 TVL	49	43	10
PANASONIC CT-1400MG	14 inches	370 TVL	280 TVL	57	54	8
PANASONIC CT-1400MG	14 inches	370 TVL	350 TVL	48	46	10
SONY PVM-8221	8 inches	400 TVL	410 TVL	48	50	10

* Denotes resolution was limited by the camera's resolution of 480 horizontal television lines.

Distribution:

- 1 Richard A. Clayton
Acting Asst. Secy. Defense Programs
U.S. DOE DP-1
Washington, DC 20585
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Dep. Asst. Secy. for Military
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- 1 Don Jewell, Asst. Director
Central Training Academy
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Albuquerque, NM 87185
- 1 D.A. Gurule, Director
Security & Nuclear Safeguards
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U.S. DOE/Albuquerque
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Albuquerque, NM 87115
- 1 L.J. Hofferth, Chief
Physical Security Branch
Security & Nucl Safeguards Division
U.S. DOE/Albuquerque
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Albuquerque, NM 87115
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U.S. DOE/Albuquerque
P.O. BOX 5400
Albuquerque, NM 87115
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Security and Nuclear Safeguards Division
U.S. DOE/Albuquerque
P.O. BOX 5400
Albuquerque, NM 87115

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Central Training Academy
U.S. DOE/Albuquerque
P.O. BOX 18041
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Aiken, SC 29802
- 1 Howard, Gnann, Chief
Safeguards Engineering & Project Branch
U.S. DOE/SR
P.O. BOX A
Aiken, SC 29802
- 1 Richard Phillips, Chief
Safeguards & Security Mgmt Branch
U.S. Doe/Amarillo
P.O. BOX 30030
Amarillo, TX 79120
- 1 Carleton, Bingham
U.S. DOE/Ch
New Brunswick Laboratory
9700 South Cass Avenue
Argonne, IL 60439
- 1 H.W. Kelly, Director
Safeguards and Security Division
U.S. DOE/Ch
9800 South Cass Avenue
Argonne, IL 60439

- 1 Thomas Gradle, Chief
Security Operations Branch
U.S. DOE/Ch
9806 South Cass Avenue
Argonne, IL 60439
- 1 Joan Christopher, Security Officer
Western Area Power Administration
U.S. DOE/RF
P.O. BOX 928
Golden, CO 80401
- 1 R.J. Levernier, Director
Safeguards and Security Branch
U.S. DOE/RF
P.O. BOX 928
Golden, CO 80402-0928
- 1 H.R. Martin, Acting Director
Safeguards and Security Division
U.S. DOE/Idaho
785 DOE Place
Idaho Falls, ID 83402
- 1 Administrator
Alaska Power Administration
U.S. DOE
P.O. BOX 50
Juneau, AK 99802
- 1 Roger Teska, Chief
Security Section
U.S. DOE/KC
P.O. BOX 202
Kansas City, MO 64141
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Safeguards and Security Division
U.S. DOE/NV
P.O. BOX 98518
Las Vegas, NV 89193-8518
- 1 Jean McGarry, Chief
Safeguards and Security Branch
U.S. DOE/NV
P.O. BOX 435
Mercury, NV 89023
- 1 Donald J. Ornick, Director
Security Division
U.S. DOE/OR
900 Commerce Road East
New Orleans, LA 70123

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Safeguards and Security Division
U.S. DOE/SF
1333 Broadway
Oakland, CA 94612
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Inspection and Evaluation Branch
U.S. DOE/SF
1333 Broadway
Oakland, CA 94612
- 1 William G. Phelps, Director
Safeguards and Security Division
U.S. DOE/OR
P.O. BOX 2001
Oak Ridge, TN 37831-8570
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U.S. DOE/RL
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Richland, WA 99352
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Richland, WA 99352
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Safeguards and Security Division
U.S. DOE
Schenectady Naval Reactors Office
P.O. BOX 1069
Schenectady, NY 12301

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U.S. DOE
Pinellas Area Office
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Largo, FL 34649
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West Mifflin, PA 15122
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Westinghouse Savannah River Co.
703-45A, Rm.150
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Aiken, SC 29802
- 1 Mark Bolton, Manager
Security Programs & Projects Dpt
Wackenhut Services, Inc.
P.O. Drawer W
Aiken, SC 29802
- 1 Wackenhut CTA
Safeguards and Technical
Security Department
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Albuquerque, NM 87185
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Mason & Hanger-Silas Mason
Pantex Plant
P.O. BOX 30020
Amarillo, Tx 79117
- 1 Ronald Perry
Argonne National Labs East
Bldg. 222 Electronics
9700 South Cass Avenue
Argonne, IL 60439
- 1 R.E. Remley
Rocketdyne Division
Rockwell International Corp.
P.O. BOX 309
Canoga Park, CA 91304
- 1 James M. Miller, Manager Safeguards and Security
Westinghouse Materials Company of Ohio
P.O. BOX 398704
Cincinnati, OH 45239

- 1 Terry Hill
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201-2693
- 1 Dale Moul
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201-2693
- 1 Harley Toy, Manager
Nuclear Services
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201-2693
- 1 C.A. Robertson, Division Leader
Los Alamos National Laboratory
Operational Safeguards and Security
P.O. BOX 1663
Los Alamos, NM 87545
- 1 M.F. Duff
Technologies Department
EG&G Mound
Bldg. OSE-211
P.O. BOX 300
Miamisburg, OH 45342
- 3 EG&G Mound
Attn: K.N. Gardner, M.A. Gibson,
C.L. Fellers
P.O. BOX 300
Miamisburg, OH 45342
- 1 J. Dollinger,
Security Department
Boeing Petroleum Services
850 South Clearview Parkway
New Orleans, LA 70123
- 1 Walk Haydell and Associates
600 Carondolet
New Orleans, LA 70130
- 1 Clifford A. Druit, Manager
Y-12 Safeguards and Security
Martin Marietta Energy Systems
Bldg. 9706-1, MS 8212
P.O. BOX Y
Oak Ridge, TN 37831

- 1 Jim Nations
Oak Ridge Gaseous Diffusion
ORGDP Security Department
Bldg. K-1652, MS-351
P.O. BOX P
Oak Ridge, TN 37831

- 1 A.K. Yancy
Martin Marietta Energy Systems
Paducah Gaseous Diffusion Plant
P.O. BOX 1410
Paducah, KY 42001

- 1 R.R. Miller
MS 1112
Martin Marietta Energy Systems
P.O. BOX 628
Piketon, OH 45661

- 1 S.L. Barnes
MS 1232
Martin Marietta Energy Systems
P.O. BOX 628
Piketon, OH 45661

- 1 Ben G. Essary
West Hanford Company
Security Applications Center
MS L6-09
P.O. BOX 1970
Richland, WA 99352

- 1 Doug Carlisle, Manager
Safeguards and Security
Pacific Northwest Lab
P.O. BOX 999
Richland, WA 99352

- 1 Ted Aichele
Pacific Northwest Lab
MS P7-76
P.O. BOX 999
Richland, WA 99352

- 1 Joe Indusi
Nuclear Engineering Department
Brookhaven National Laboratory
Bldg. 197C
2400 Upton Road
Upton, NY 11973

- 3 L. Runge, G. Schoenen, & K. Dahms
Brookhaven National Laboratory
Bldg. 50
2400 Upton Road
Upton, NY 11973
- 1 DCS/Security Police
U.S. Air Forces in Europe
APO New York 09012-5001
- 1 Chief of Security Police
AF Systems Command
Andrews AFB, DC 20334-5000
- 1 William A. Wall
FAA Technical Center
ACT-360, Bldg. 202
Atlantic City Airport, NJ 08405
- 1 Defense Intelligence Agency
DIA/DX-7B
Bolling AFB, DC 20301-6734
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Transportation Systems Center
Kendall Square
Cambridge, MA 02142
- 1 Defense Intelligence Agency
DIA/OS-2A
Bolling AFB, DC 20301-6734
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DIA/DT-2B
Bolling AFB, DC 20301-6734
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Alaskan Air Command
Elmendorf AFB, AK 95506-5001
- 1 Belvoir Research, Development
and Engineering Center
Attn: STRBE-JI (A.Zushin)
Fort Belvoir, VA 22060-5606
- 1 Belvoir Research, Development
and Engineering Center
Attn: STRBE-ZM (J.M. Hale)
Fort Belvoir, VA 22060-5606

- 1 Belvoir Research, Development and Engineering Center
Product Manager
Physical Security Equipment
Attn: AMCPM-PSE
Fort Belvoir, VA 22060-5606

- 1 Commander
US Army Troop Support Command
Attn: STRBE-1-POLIC (M. Jennings)
Fort Belvoir, VA 22060

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USAJFKSWCS
SOTIC
Ft. Bragg, NC 28307-5000

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1st SOCOM
ODCOPS-Special Projects
Ft. Bragg, NC 28307

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Dept. of Army
1st Special Forces Operational
Det.-Delta
Ft. Bragg, NC 28307-5000

- 1 U.S. Army Military Police School
ATZN-MP-TS (Capt. Sanders)
Ft. McClellan, AL 36205-5030

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National Security Agency
M51
Ft. Meade, MD 20755

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Building Security Group
National Bureau of Standards
Gaithersburg, MD 20899

- 1 485th EIG/EICI
Attn: C. Winters
Griffiss AFB, NY 13441-6348

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Hanscom AFB, MA 01731

- 1 DCS/Security Police
Pacific Air Forces
Hickam AFB, HI 96853-5001

- 1 Commander
U.S. Army Engineering Division
Attn: HNDED-ME, Electronic
Technology
P.O. BOX 1600
Huntsville, AL 35806
- 1 HQ U.S.AF/AFOSP
Attn: Gen. Frank Martin
Kirkland AFB, NM 87117-6001
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Air Force Office of Security Police
Kirkland AFB, NM 87117-5000
- 1 Director of Operations (SPO)
Air Force Office of Security Police
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- 1 Chief of Security Police
Tactical Air Command
Langley AFB, VA 23665-5000
- 1 DCS/Security Police
Strategic Air Command
Offutt AFB, NE 68113-5000
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215 North 17th Street
Omaha, NE 68102
- 1 Chief of Security Police
AF Space Command
Peterson AFB, CO 80914-5001
- 1 Naval Civil Engineering Laboratory
Attn: G. Cook L-56
Port Hueneme, CA 93043
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Electronic Security Command
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O.U.S.DRE/TWP/SP
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Washington, DC 20505
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Chief
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U.S. Secret Service
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Development
1800 G Street NW, Rm 941
Washington, DC 20223

1 John C. Hagan
National Aeronautics and Space
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Washington Field Office
10th St. and Pennsylvania Ave. NW
Washington, DC 20537

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