Plasma Screen Test Plan and Results

TransLumen Technologies, LLC

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Introduction

TransLumen Technologies has created opportunities for the use and application of its technology for electronic displays including immediate business application and commercialization. The company is targeting businesses that are directly involved with providing digital graphic content for electronic screens or the manufacturers of such screens.

TransLumen Technologies LLC is headquartered in Chicago, Illinois. The company has its technology patented and it covers the advanced algorithm and extensive and comprehensive enumeration of uses. A separate image-processing patent has also been awarded for, in addition to the filing for the International PCT patent.

Description of the Technology (Excerpt from U.S. Patent # 6,433,839, #6,580,466)

TransLumen's patented technology will be employed to add new dimensions to operator decision-making by using graphic feedback displayed on electronic display backgrounds and objects. The technology provides methods/systems for producing images along a transition path wherein sequential images are imperceptibly different from each other, from media/devices carrying the images, and from methods/systems employing the images. In one aspect, the resultant display of such an image series or set is a "still" image that evolves unobtrusively over time. This provides an image display that can allow display-to-display images without introducing distraction. Furthermore, such a display can present a required realism to the eye. This capability can be embedded into electronic backgrounds or objects to provide additional objects for testing, evaluation, measurement and increased information flow. In summary, TransLumen's technology automatically manipulates images, seamlessly and continuously over time, below the level of normal human visual perception.

Currently, there are no other products that can automatically produce a seamlessly changing image below the level of human perception. It provides a new medium for turning both still and motion images into a continuously evolving form of imagery, while appearing as a static image at any given point of time. Integrated with text or graphic content, it provides a new way to view images and information.

In replacing static backgrounds with backgrounds that change over time and by adding new data/informational visual output to the electronic display, the user will not be distracted by visual noise. This technology will be applied to the goal of designing elements into an interface that will show usable progressive views to provide interpretive information.

Its advanced algorithm can exist in the form of software or be programmed and embedded into chips resident in hardware.

Purpose of the Study

The purpose of the study is to quantify the effects of TransLumen's technology when applied with graphics on plasma screens. Appearing static over prolonged periods of time, the goal is to employ the technology to reduce plasma screen burn-in as a result. This first set of testing analysis has been designed to provide a cohesive environment for a test screen simulation with alphanumeric features representative in screen displays.

Test Methodology and Work Plan

A plasma was delivered to TransLumen from a leading plasma manufacturer's facilities. Instrumentation to measure foot-lamberts was sent as well.

SCREEN AND DVD ELECTRONIC DEVICE AND INSTRUMENTATION DESCRIPTION

A 42" plasma monitor was tested over a period of time using the technology (this test will be described in the following section). The results to be described later in this report will demonstrate that the screen design and associated test measurements lead to valid conclusions. For the purpose of the report, we will describe the monitor for its test study design, implementation and analysis.

DVD Players were purchased for these tests. A Panasonic DVD player was used on a 24X7 basis and performed without any interruption along with the plasma screen.

The instrumentation that measured the foot-lamberts was an auto color Pro II by Sencore used in conjunction with a HP Jornada 540 series pocket PC. As each reading was taken, TransLumen recorded digitally the environment's temperature, barometric pressure, relative humidity, ambient light and foot-lamberts.

Test Screen Design

The test patterns that were designed were sent to OEM engineering management for review. The screen test patterns were approved. The grid below for the monitor represents a pictorial view of the proposed effects that will overlay the shaded quadrants.

The monitor was partitioned into four quadrants to test various effects related to employing TransLumen's technology. The quadrants were remapped from 5,6,7,8, to 1,2,3 4. Quadrants 1 and 2 used different levels of TransLumen's technology plus Gaussian noise distribution. Gaussian noise was introduced to allowed some adjacent pixels to have varying degrees of illumination on a random basis and to allow pixel cooling as TransLumen's technology shifted the position of an image. Quadrant 3 was used to test color and Quadrant 4

was used as a control, possessing a test pattern screen without the technology's attributes. The other quadrants changed continuously implementing TransLumen's technology, under the threshold of observable change. *(See Figure 1.1 through Figure 3.3 for graphic depiction)*

1 - Gaussian distribution noise pattern over cloud movement (grayscale steps)	2 -Gaussian distribution noise pattern over cloud movement with content movement (grayscale steps)
3- Gaussian distribution noise pattern over cloud movement with content movement (color steps)	4 - Control screen Black background (grayscale steps)

The elements included four quadrants with each having a color or grayscale composed of eight discreet progressive stepped sections. These grayscale steps had shades ranging from a 0 to 100 % density. They were evenly divided over each quadrant taking the shades from a maximum white to a maximum black.

Testing Procedures

The initial test measurements were taken each hour for the first 24 hours to assure that the simulation was running properly and that if dramatic changes were exhibited in the first 24 hours the measurements would capture such changes. Given that changes were not significant during said timeframe, the recordings were subsequently taken the same time each day. The system and simulation ran continually throughout the testing period. The simulation was set on a continuously 60 minute loop and was held at 0 minutes for the actual readings to be taken.

Significant burning differences between the control and the quadrants with TransLumen's technology signaled the conclusion of the examination period. The monitor readings were taken over a period of 1512 hours.

Post Audit Work Plan Milestones and Deliverables

The following table defines the general stages of work that were performed. The project was organized by defining the reporting structure, responsibilities and deliverables for the implementation team.

The following table provides the project chronology:

Milestones	Deliverables	
Project components with … ➢ Designed test screens ➢ Testing criteria ➢ Initial Benchmarks ➢ Overall Test duration	Program Management Plan ➢ Signoff by manufacturer's engineering management	2
Run Test Simulations ➢ Establish views for user decision paths	On-screen interactive visualization complete	2
Data accumulation	Measure and document data points, report and graph results by screen	8
Draft final report with technical data	Final report with technical data and documentation for signoff	1

Principle Evaluator

The study will be lead by Doug Siefken who brings over 30 years experience in imaging, software development, systems design and programming. During his tenure with the US Navy, Mr. Siefken developed software applications for photographic laboratory inventory control and a payload distribution system for naval aircraft. In addition to software applications, he assisted with the development of optical flight guidance systems for smart munitions. He also worked with a cartographic mapping squadron, mapping various areas in Asia. Other duties involved working with high altitude imaging and non-visible spectrum remote imaging and managing US Navy photographic laboratories. During Mr. Siefken's military service and after combat duties, he completed his higher college education with high honors. After serving in the military, Mr. Siefken continued to author software packages for private industry. He assisted with the launch of the OC8820 CP/M based microcomputer introduced by Litton and also developed one of the first multimedia cross-platform digital art portfolios. Mr. Siefken was one of the founders and served as the President of CyberCity Tours, Inc., a new media publishing

and content provider formed in 1994. Under that company's auspices, he developed and commercially marketed CD-ROMs for companies such as Unicom and Cahners Publishing. He is a pioneer in integrating interactive new media such as the CD-ROM and Web based products with traditional marketing applications. Douglas Siefken is the inventor of the TransLumen's technology.

Test Results

The test data indicates that TL technology combined with Gaussian noise distribution, as a method for mitigating screen burn-in, was successful. As shown in Figure 3.4, a graph depicts foot- lamberts levels by comparing Quadrant 2 readings on 12/12/02 compared to Quadrant 2 on 2/10/03 and Quadrant 4 readings on 12/12/02 to Quadrant 4 readings on 02/10/ 03. The incremental readings from the control Quadrant 4 lost brightness (burned) more rapidly than those in Quadrant 2. Figure 3.4 was based upon the monitor readings with a signal; Figure 3.5 was based on monitor readings without a signal. This is also evidenced through the digital photograph Figure 4.0, which shows the highest degree of burn-in Quadrant 4, followed by Q1 and finally Q 2 and Q3.

Future Test Recommendations and Potential Next Steps

We advise that the manufacturers review these results together so that the full experience of the test is discussed. Given the experience to date, TransLumen recommends that we jointly create another test with a prototype to take this success one step further. Some initial recommendations as it pertains to the testing environment with TransLumen's technology are as follows:

1. Test with a technique related to controlled forced dithering.
2. Introduce a second monitor without Gaussian noise distribution for additional comparisons.
3. Test in a controlled low ambient light environment.

We also have potential creative ideas, which we would like to discuss in the area of experimentation for salvaging or repurposing screens that already have 2 or 3 degree burns with the potential to reintroduce them in the marketplace. We would like to contribute to the next generation of plasma screens and believe our innovation will follow with significant ROI's for the manufacturer based on fewer returns, increased customer satisfaction and this effort.

Future General Applications

As display technology proliferates beyond today's markets, TransLumen will seek to be a critical component in screen design and implementations. The following areas among others are currently being evaluated for future market launches.

Commercial Application Areas

Environmental Backgrounds – With larger displays and future thin film technology, there will be a proliferation of environmental backgrounds for waiting areas such as hospitals, airports and prisons; anywhere people are situated for moderate to extended times. This technology is also poised for enhancing living spaces for long-term space travel. Factory walls with occupational messages will be enhanced by electronic display content for safety and training messages.

Outdoor and Indoor Media – TransLumen bridges the gap between traditional print media and video. By implementing software and firmware into digital electronic screen displays, which include indoor billboards, outdoor billboards and video walls for advertising and messaging, it will be possible to create continuous and seamless change within and behind images creating the opportunity for more advertising impressions.

Commercial Transportation – TransLumen provides feedback controls for aircraft and other transport related industries using electronic backgrounds for multiuse visual input and output. The electronic control panel will merge information based on real time and discreet periods. Analytical parameters are used to convert resulting determinations into graphical outcomes representing the perceived correct or incorrect choices. The user or operator will determine the correct decisions by recognizing visual cues, changing situations and information that are a part the background itself.

Gaming industry – Integration of the technology will enhance gaming for the next generation game stations and Internet Web based games. Replacing static backgrounds with a new simulation environment will add dynamic game elements not currently used in the industry. This introduction will add new dimensions to interactive games with little additional CPU overhead and the ability to play the games on more display options.

Software -The professional software suite will be introduced and be available as individual or multiple installation licenses. The applications and plug-ins are targeted at digital imaging specialists, concentrating on those using high-end editing systems. TransLumen's technology will enable complex scenes to be rendered in a more efficient manner with its advanced algorithms as defined by the company's Slipcover™ methodology.

PDA and wireless graphics interfaces – will be expanded for visual playback, personalization and advertising messaging. These same advantages are also offered through other appliances and kiosks.

Health - Industries will be able to develop new diagnostic screens for optical clinical evaluation covering color blindness, protocols for patients who cannot communicate and more finely tuned measurement standards.

Cable/Satellite - Based on the inherent value of TransLumen's data transmission, graphic products and artwork can be streamed to television and other networks.

Defense, Security and other Applications

Human Computer Interface/ Artificial Intelligence - A composite of images will create the graphic interface. TransLumen's technology will be applied to designing elements into an interface that will guide or train users towards accurate and/or clearly defined outcomes. Graphical representation will have usable progressive views to provide interpretive information to increase a human operator's visualization and performance capabilities in the area of Human-Automation Interaction. It will now be possible to provide intelligent interpretive direction by employing formerly unused areas of display/control panels.

TransLumen's technology will incorporate a knowledge-based system to interpret the coding utilizing color, texture, luminance etc. and their gradations to display the results. The technology will be applied to the goal of designing elements into an intelligent interface that will train and guide computer programmers/users toward more efficient and accurate decisions. The work will produce analytical parameters to convert resulting determinations into graphical outcomes representing the perceived correct or incorrect choices.

Training Systems Evaluation Research - TransLumen has various levels of applicability for immediate implementation into the design of training and research simulations including gaming for software and the Internet. The fact that the technology can impact, change and utilize real photographic image inputs will make the transfer between the simulator and real environments more effective for bridging to real life circumstances.

Battlefield Simulation - Used as an environmental background for target recognition designed to finely tune situational awareness for visual recognition skills. The technology can be applied to VR and non-VR environments.

Training Measurement Standards - Imbed into training system technology the interaction of imagery with the individual's ability to perceive change. Under controlled test circumstances, an individual's level of perception in simulation can establish testing benchmarks and performance measurement tools. A potential set of standards can establish new tools to measure visual recognition variances for outdoor and indoor environments across diversified conditions.

Cyber Sickness - A byproduct of scientific advancement is the inundation of multiple screen stimuli. An environment, which relies on digital changes, can be enhanced by TransLumen's unobtrusive changes in imaging. Individuals would benefit by the reduction of visual electronic noise and unnecessary stimuli providing a more natural environment, which can be programmed for the individual's surroundings.

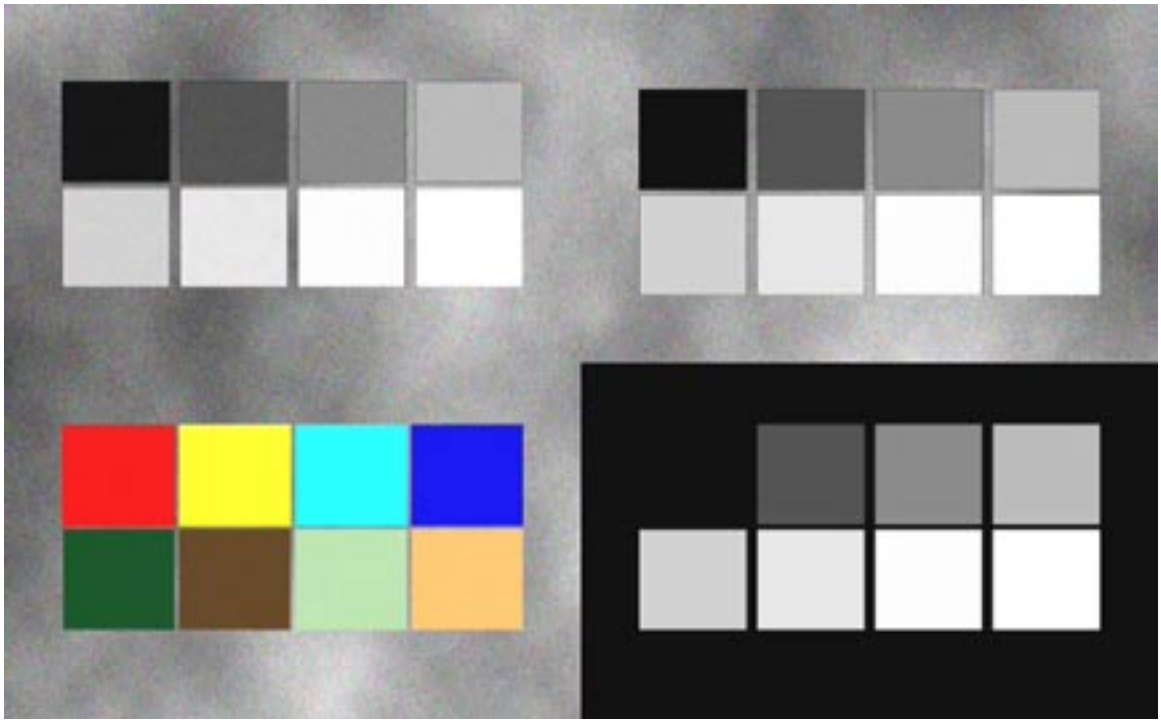
PDA's and Wireless - TransLumen technology can be deployed for advanced distributed learning (ADL) applications for the use in commercial off the shelf (COTS) personal digital assistants (PDAs) and other wireless devices. Applications include assessment and treatment options for injury and disease scenarios, chemical warfare simulation and mapping. The technology will be employed to test the feasibility to download realistic environments that change over time and with subtle transformations of graphical views.

Urban and Terrain Mapping - TransLumen Technologies will use its patented imaging technology to increase the visualization and performance capabilities of three-dimensional urban environments through advanced scene management. The technology will render dynamic electronic backgrounds by employing its advanced algorithms. Digital models will be created that segment larger complex scenes into distant and intermediate zones adjacent to the 3D rendered foreground zone. Fuzzy logic will be employed to fill in voids of data to ensure the realistic integrity for visualization.

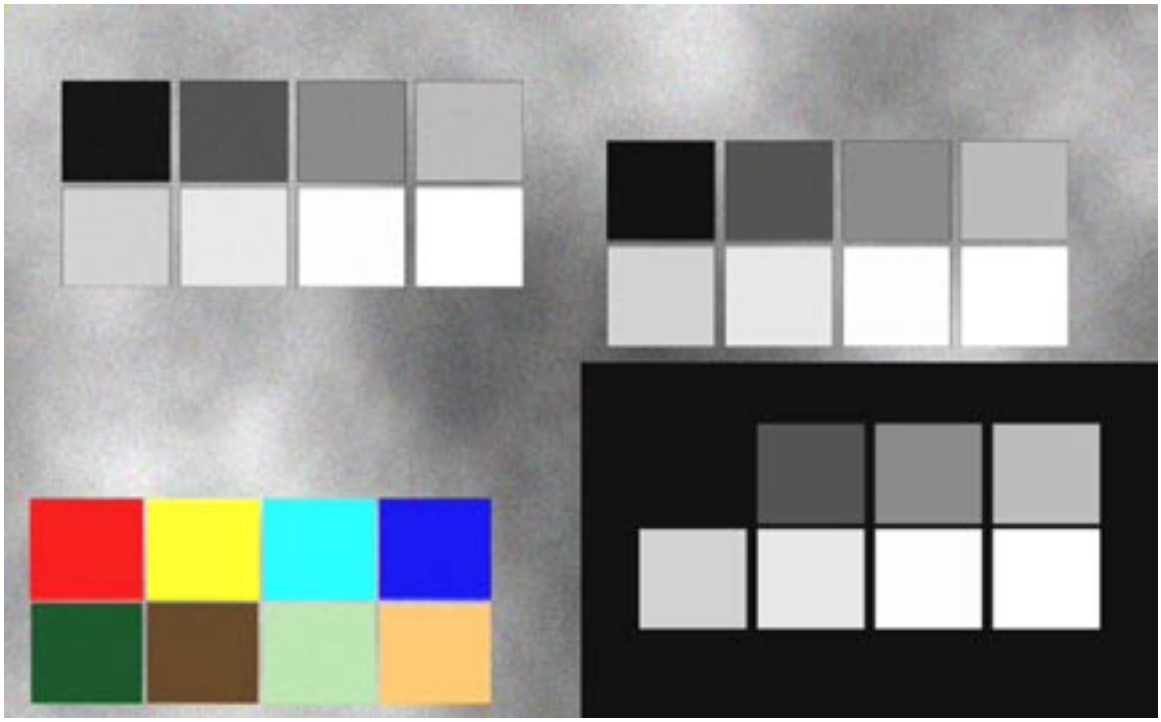
Examples of Benefits

- Visual output to electronic images with little additional CPU overhead
- High resolution by applying complex datasets only in required areas
- Increase human operator's visualization and performance capabilities in the area of Human-Automation Interaction
- Automated graphic evolution across varied operating software and hardware systems and their diversified specifications
- Improve the visualization of complex scenes
- Progressive views to provide interpretive information
- Shorten the HCI development cycle while optimizing the final programming result
- Enhance imaging, data transmission and viewing capabilities for electronic control panels

Plasma screen burn mitigation test methodology

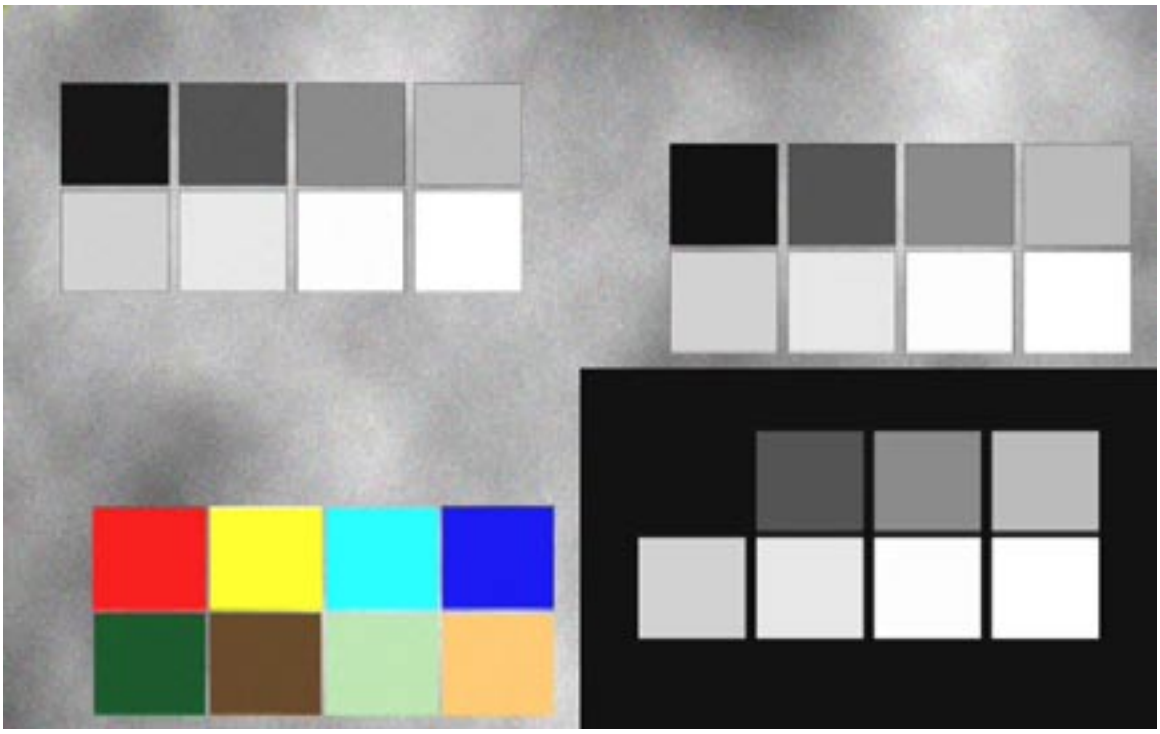


0 and 60 minute points in evolution *figure 1.1*

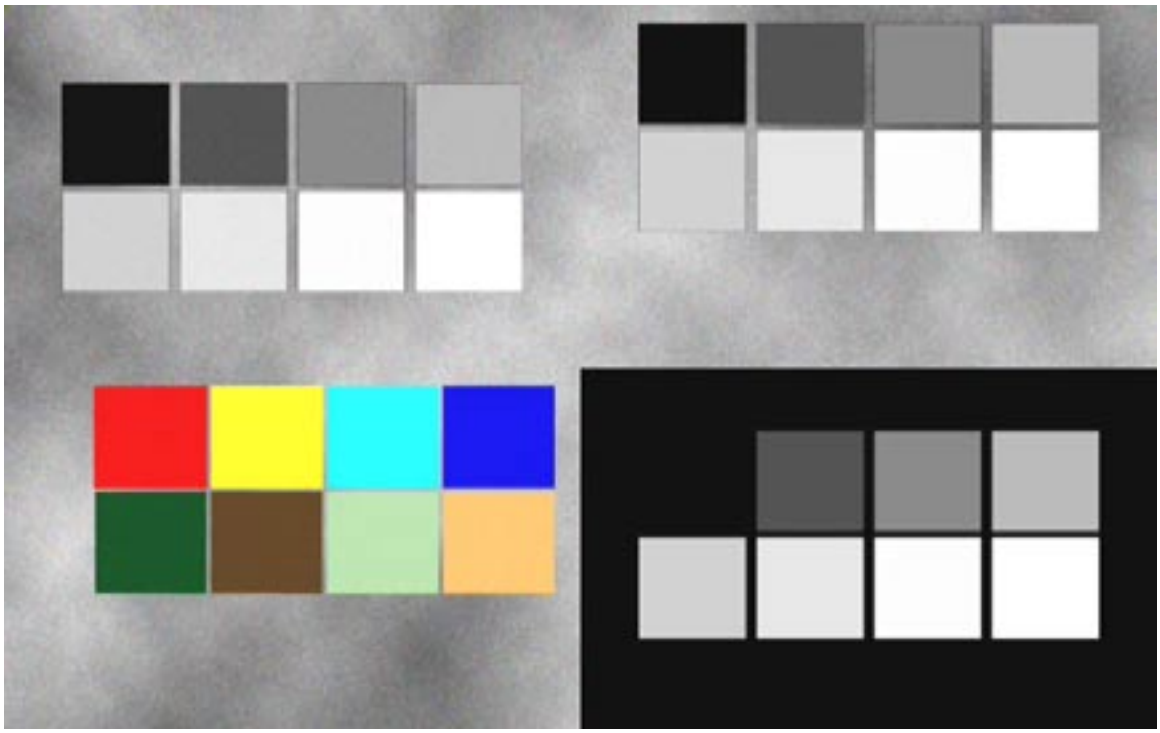


15 minute point in evolution *figure 1.2*

Test Methodology

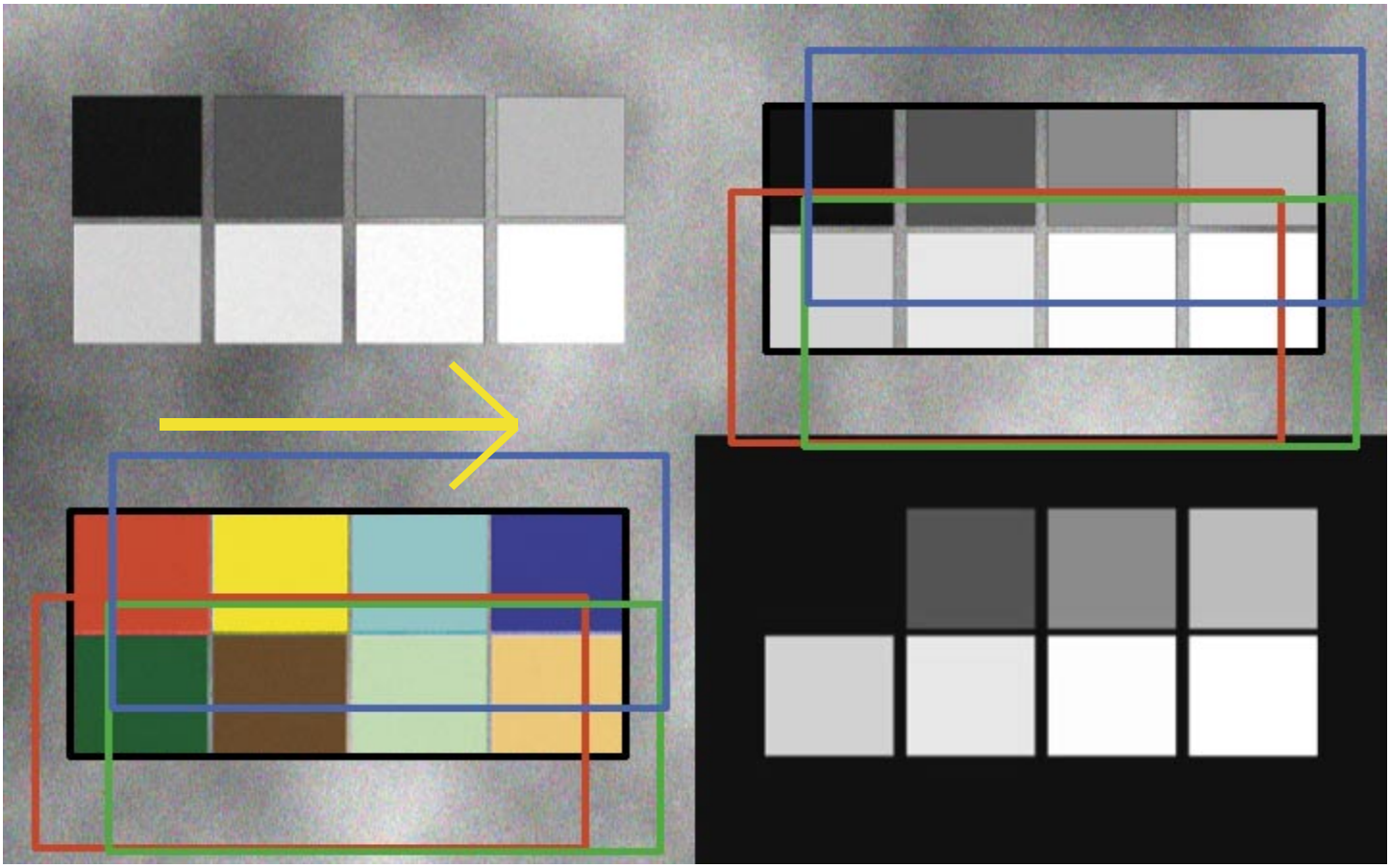


30 minute point in evolution *figure 1.3*



45 minute point in evolution *figure 1.4*

Test Methodology



Motion pattern

figure 2.1

1. **Position at 0 and 60 minutes - Black**

2. **Position at 15 minutes - Red**

3. **Position at 30 minutes - Green**

4. **Position at 45 minutes - Blue**

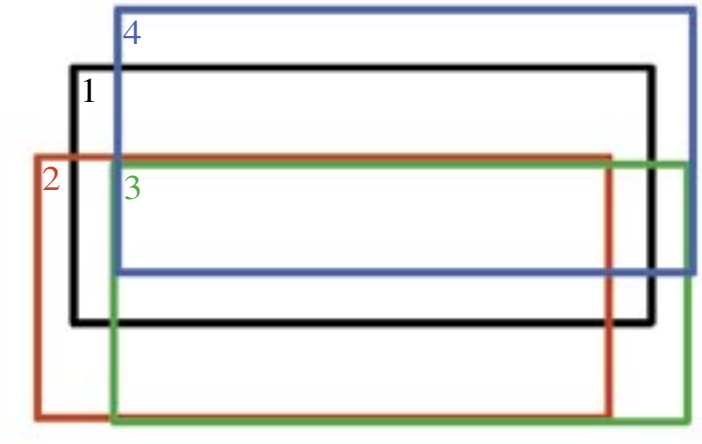


figure 2.2a

5. **Background direction of change - Yellow left to right (arrow)**

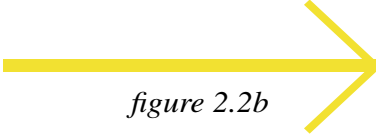


figure 2.2b

Plasma screen burn mitigation test results

Quadrant 1	Quadrant 2 TransLumenized Optimum effect
Quadrant 3	Quadrant 4 Control

figure 3.1

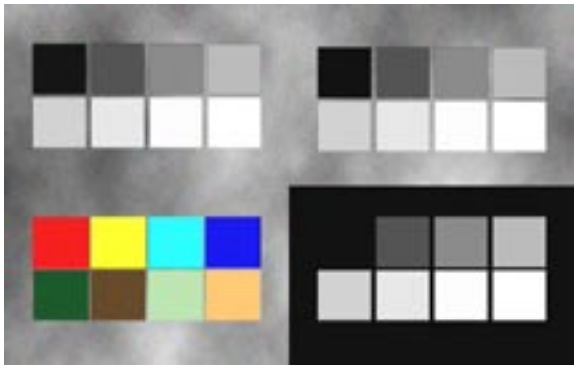
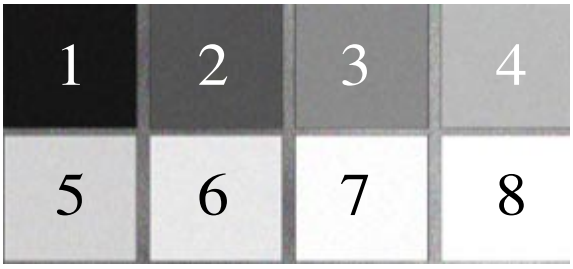


figure 3.2



Gray scale step numbers
figure 3.3

Test with signal (image)

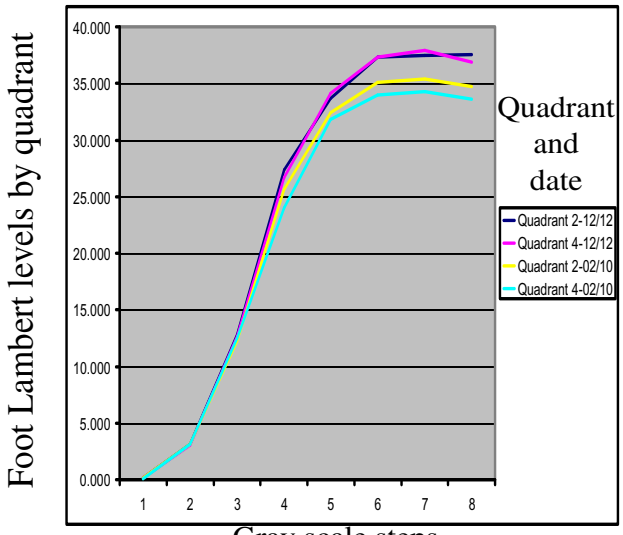


figure 3.4

Test with no signal (blank)

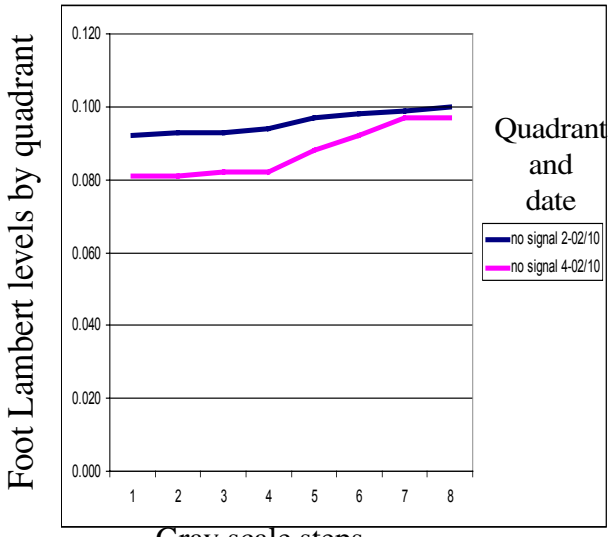


figure 3.5

Test Results

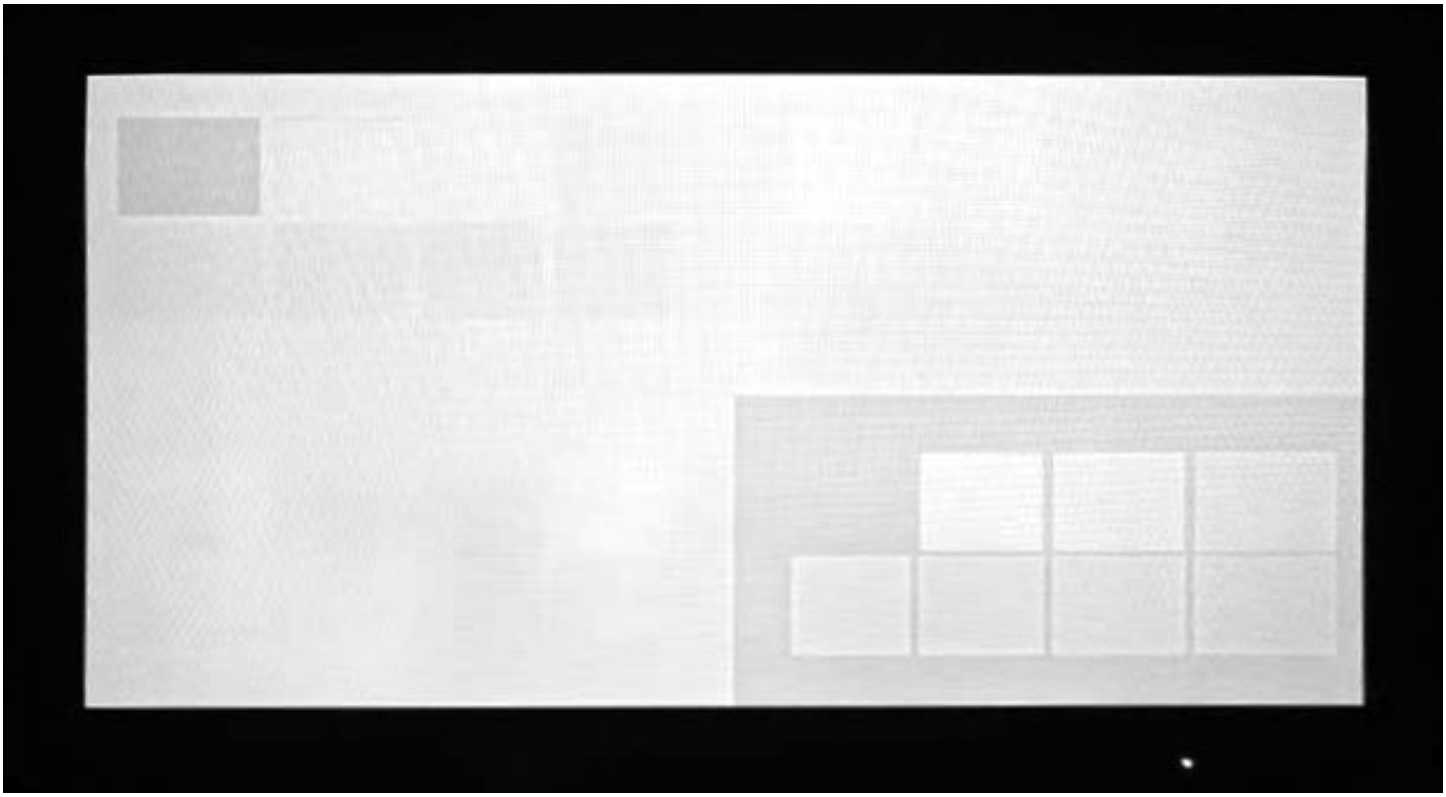


figure 4.0

Screen with no signal - power on
digital photograph