

AccuCal™

# Audio/Video Reviews

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## Front Projection Screen Material Report

### Overview

Front projection screens are a large part of the performance of a front projection system. The screen materials tested in this report in no way encompass all of the materials on the market, but do explore a few of the products from Carada and Da-Lite. These include the Classic Cinema White from Carada and Video Spectra 1.5, Da-Mat®, HD Progressive 0.6 and the HD Progressive 0.9 from Da-Lite.

These measurements examined each screen's reflectivity and color neutrality when viewed from the center and a seating position to the side in a dedicated home theater environment. The tests did not compare the mounting systems for the various materials tested. Visual observations of how these materials perform is also included.

### Summary

The results from these tests indicate that many of the screens tested are very color neutral with two exceptions. Da-Lite High Power demonstrated a significant color shift depending on the viewing angle. Video Spectra 1.5 also demonstrated some color shift that was viewing angle dependent. In no case did a screen show a significant change in luminance from one color versus another color tested at a given screen angle. All of the observed color shifts to the projector light were also more complex than a white balance shift.

My personal favorite of those tested was the Classic Cinema White. The ability to use this material will depend on the level of light control in your cinema, screen size, projector light output and if you can use a fixed screen. The difference between the Classic Cinema White material and the Da-Mat® or HD Progressive 0.9 was not large. Either one of those may fit your needs better than the Classic Cinema White depending on your situation. The High Power is a special material that can be very useful in certain circumstances, but it does come with significant limitations and compromises in performance.

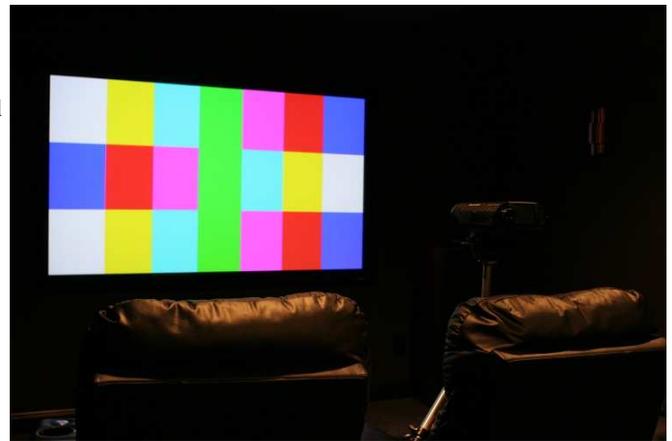


Figure 1 - Room and spectrophotometer used.



Figure 2 - Spectrophotometer used.

**Measured Test Results**

The following table shows the results of a series of measurements for the tested screen materials.

Material	0° Gain	18° Gain	0° σ Lum	18° σ Lum	0° Max x	0° Max y	18° Max x	18° Max y	0° Avg x	0° Avg y	18° Avg x	18° Avg y
Classic Cinema White	0.97	0.95	0%	1%	0.001	0.003	0.001	0.003	0.000	0.002	0.000	0.002
Da-Mat®	1.09	1.00	1%	1%	0.002	0.001	0.002	0.003	0.001	0.001	0.001	0.002
HD Progressive 0.9	0.98	0.95	1%	1%	0.003	0.002	0.003	0.002	0.001	0.001	0.001	0.001
HD Progressive 0.6	0.72	0.70	1%	1%	0.003	0.002	0.003	0.001	0.001	0.001	0.001	0.001
Video Spectra 1.5	1.27	1.15	1%	1%	0.002	0.003	0.002	0.007	0.001	0.001	0.001	0.004
High Power	1.82	0.96	1%	1%	0.002	0.006	0.009	0.012	0.001	0.003	0.004	0.005

0° - Measurements at this angle are perpendicular to the screen

18° - Measurements at this angle were taken 18 degrees to the side and 6 degrees down, but are of the same location as the 0 degree point on the screen

Gain - Average of 10 colors ratio of light at the observer to light sent to the screen.

σ Lum - Standard deviation in luminance difference for each of the 10 colors measured after factoring in the measured screen gain.

Max. x or y - Maximum absolute change in CIE color measured as caused by the screen for the 10 colors measured

Avg x or y - Average absolute change in CIE color measured as caused by the screen for the 10 colors measured

**Screen Material Observations And Comments**

Classic Cinema White - This material was very color neutral. It does have a slight amount of texture, but this was not visible at a 9' viewing distance. It did not appear to lend much character to the image which is a good thing. It has a very slight sheen compared to a piece of paper, but I did not notice it in real images. This material will not aid in increasing the image brightness for projectors with lower light output than the screen size desired.

Da-Mat® - This material was very color neutral. It does have a little more texture than the Classic Cinema White, but this was not visible at a 9' viewing distance. It had a slight sheen to it which was visible on images infrequently. This material is advertised as 1.0 gain, but a 1.09 gain was measured and consistent with the light falloff found at the 18 degree observation point. This gain might be useful to add a slight increase in image brightness for the center seat.

HD Progressive 0.9 - This material is very color neutral. It appeared to be a very smooth surface. It also has a very slight sheen to it which was visible on images infrequently. This may explain its gray coloring and yet a gain very nearly 1.0. It did not add much character to the image. This is seen in the data. This material will not aid in increasing the image brightness for projectors with lower light output than the screen size desired.

HD Progressive 0.6 - This material is very color neutral. It appeared to be a very smooth surface. It also has a very slight sheen to it which was visible on images infrequently. The sheen on this was stronger than the HD Progressive 0.9 sample. This material would require much more light to illuminate the same screen size than any other sample tested here. A product like this is for special circumstances and would not fit most peoples requirements.

Video Spectra 1.5 - This material was mostly color neutral. The surface was patterned on this product. The color shifts induced by this material would not be strong enough to bother most people. The color errors were not just a white balance shift that would be easily corrected. This material did add character to the image that was very distracting compared to the other samples. The sheen on this product was obvious on brighter images. The gain of this material would aid in increasing the image brightness for projectors with lower light output than the screen size desired. This was the most objectionable material of those tested for home theater use and is not one I would recommend.

High Power - This material was the least color neutral of those tested. It appeared to be a very smooth surface. The color shifts induced by this material may be strong enough to bother some people. The color errors observed were not just a white balance shift that would be easily corrected. This is a retroreflective material that works best when the projector is mounted near the viewers head. The ceiling mounting in this theater is more common and shows the reduction in performance from this orientation. This product did contain some sparkling elements that are visible when viewed at closer distances. The gain of this material would aid in increasing the image brightness for projectors with lower light output than the screen size desired.

### **How To Use These Results**

These measurements and observations may help you understand what can affect screen performance and help you judge how well the screen will perform for home theater use. Please refer to the manufacturer for more information on these products. You should always obtain a screen sample before ordering a screen to see if it fits your needs. It is best to use the sample in your theater after the room is setup except for the screen. The projector your choose, the projector mounting, screen size, screen position, distance from the screen along with the viewing angles in your situation will determine how well the screen performs for you.

### **Test Conditions**

The conditions of this test were as follows.

This room had no windows, dark walls, equipment rack was in the hall not facing screen and minimal light sources were present in the room. All room lighting was off at the time of the tests. The most significant light source was a PC that was dimmed, in the back of the room and facing the rear of the room. Background light sources with the projector off were measured to add 0.000073 fL to the Carada Classic Cinema White screen. All color and screen luminance measurements were made with the PR-670 carefully positioned and tripod mounted to measure an area that was projected as a target from the projector. This was true for both luminance and illuminance measurements. The same measurement series taken at the beginning of the test was also repeated at the end to help ensure that nothing had drifted significantly.

The Carada Classic Cinema White screen used in these tests is the screen installed in this theater. All other screen materials in these tests were samples from Da-Lite. Screen gain measurements could be influenced by the screen samples not being tensioned like the Carada. Multiple attempts were made to position the sample to keep the sample flat in the area being measured. All screen samples were taped to the Carada screen for measurement. Only one screen sample was used for each screen material tested. None of the samples appeared to be damaged.

The projector in this case was ceiling mounted in the center of the screen horizontally and vertically above the screen. Maximum vertical shift was used in this product. The projector was also warmed up for 2 hours before color measurements were taken to stabilize the output colors as much as possible. The spot measured was 32.5" lower than the projector's center of projection. The projector was also on high lamp mode and the image sized for an 86" diagonal 16:9 screen near the minimum throw of the projector. This provided a bright image to maximize the signal to noise ratio of the measurements.

The test patterns used to measure light output and color were all created by an Accupel HDG-4000. The patterns used were window patterns to minimize the scattered light sent to the walls, floor and ceiling. The colors measured included red, green, blue, yellow, magenta, cyan, desaturated blue, desaturated green, desaturated red and white.

The PR-670 was set to measure a 1 degree field of view and extended range with the smart dark feature off. The PR-670 was AC powered during these tests. Actual screen light levels measured between 0.4 fL and 16.5 fL. At no time did the PR-670 report a value as being out of range. Nominally the light levels ranged between 1 fL and 10 fL. The MS-75 lens attachment was used to measure the screen and a CR-670 cosine corrector was used to measure the light from the projector directly.

Screen material observations were made in normal room lighting and with light from the projector. Screen observations included test patterns and a variety of movie material. Observations of movie images were made at 9' at 18 degrees off center and sitting at the center of the screen with an 86" diagonal image and a maximum light level of 15 fL from the Classic Cinema White screen.

No measurements were attempted to measure hot spotting because these problems can vary with the projector, but screens with more gain tend to have more issues with luminance varying with the location of the image on the screen. Retroreflectors like the High Power tend to have fewer problems with this than other high gain options.



Figure 3 - Screen samples at 0 degrees from top left to right Da-Mat@, HD Progressive 0.9, HD Progressive 0.6, Video Spectra 1.5 and High Power on a Classic Cinema White background.



Figure 4 - Screen samples at 18 degrees from top left to right Da-Mat@, HD Progressive 0.9, HD Progressive 0.6, Video Spectra 1.5 and High Power on a Classic Cinema White background.

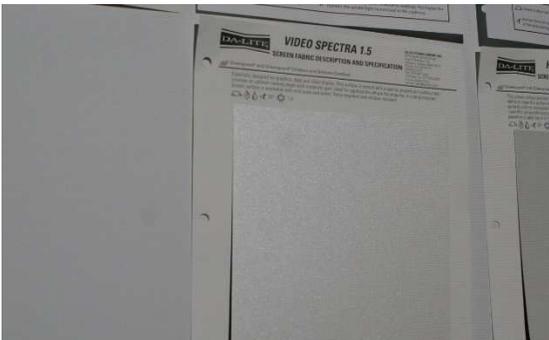


Figure 5 - Close up of Video Spectra 1.5 showing sheen..

**Manufacturers Websites:**

**Carada** [www.carada.com](http://www.carada.com)

**Da-Lite** [www.dalite.com](http://www.dalite.com)

**Equipment Associated With Review:**

Test:	Accupel HDG-4000	Video:	JVC DLA-RS20
HDTV Generator:	Photo Research PR-670	Projector:	Sony PS3 (variety of movie trailers)
Light & Color Measurement:	Custom low light instrument	Video Source:	
Low Light Measurement:			

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