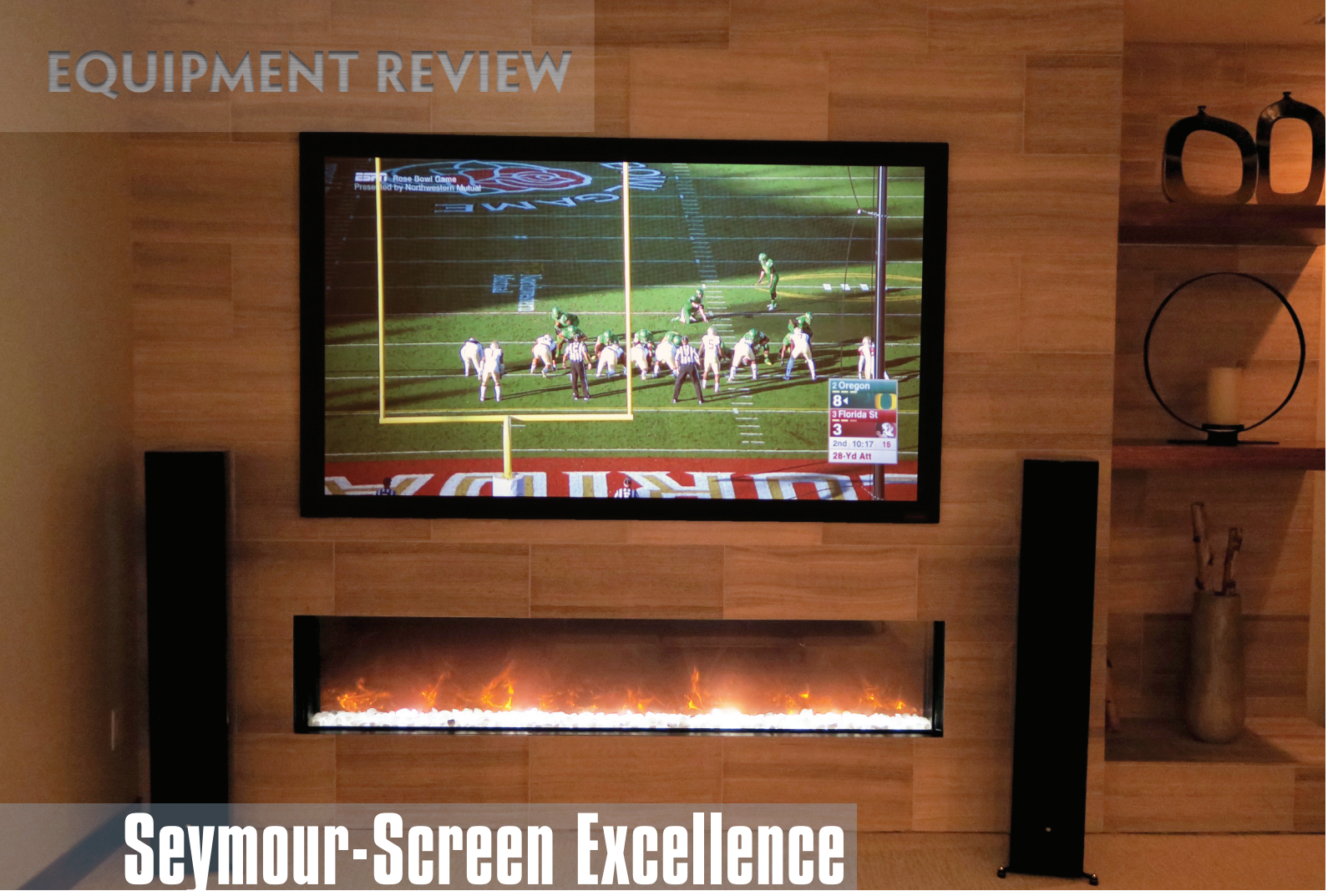

Seymour-Screen Excellence

Ambient Visionaire Black Projection Screen

Doug Blackburn

Seymour-Screen Excellence is a joint venture of Iowa-based Seymour AV and UK-based Screen Excellence. Seymour AV makes projection screens and related products, an audio amplifier and audio cables. Screen Excellence sells a range of projection screens and related products. I reviewed their acoustically transparent Enlightor 4K projection screen material in 2011.

The Seymour-Screen Excellence Ambient Visionaire (AV) ambient light-rejection projection screen family currently includes three different screen materials: Silver 2.1 (gain), Silver 1.3, and Black 1.2. The subject of this review is the Black model, which does not look black without a projected image. It looks more like a medium-dark gray. These ambient light-rejection materials rely on dithered nano-mirrors to reflect the image while allowing off-axis ambient light to be captured and absorbed. You can probably figure out that nano-mirrors are very tiny—so tiny that Seymour-Screen Excellence says there's an average of 5,000 nano-mirrors per pixel at "4K" resolution. When I asked Chris Seymour what screen size they were using for this example of nano-mirrors per pixel, he said it would hold approximately true for a 122-inch diagonal (about 107-inches wide at 1.78:1 aspect ratio) projection screen. If you were to drop down to a 96-inch diagonal/84-inch wide screen, there would be about 40 percent fewer nano-mirrors per UHD pixel; so figure on around 3,000 nano-mirrors per pixel on the smaller projection screen. With so many reflecting elements per pixel, the screen won't add grain, moiré, or other artifacts. The "dithering" of the nano-mirrors means they aren't all aimed in the same direction. Each nano-mirror sits on top of the binder layer at a slightly different angle than its neighbors. This causes small gaps between high nano-mirror edges and low nano-mirror edges. Ambient light coming at the screen from odd angles (sides, top, bottom, etc.) gets trapped in those gaps and is either absorbed by the black light-absorbing particles in the binder or the light passes through the binder to the dark gray light absorbent layer under the binder/mirror coating. The randomly tilted nano-mirrors provide an almost infinite number of tiny light traps that allow light from the projector to be reflected back to the viewers, while light from sources at other angles gets "sucked in" to the tiny light traps where it is absorbed. It's a clever approach to a tricky problem.

The substrate the active layers are applied to feels like a substantially thick Mylar-type material. It is flexible enough to roll up for shipping in a tube, but it is not "stretch-y" at all. The screen comes with grommets around the perimeter. You slip a rubber o-ring through the grommet and over a corresponding post on the back of the frame. The stretch-y rubber o-rings maintain equal tension on all sides of the screen, keeping it flat and secure in the frame.

Setup And Use

For conventional flat screen frames, Seymour-Screen Excellence offers three different "rail" widths, all covered with "Infinite Black" velvet so that any bleed-over around the edges of the frame is absorbed. In addition, there are curved frame options and options for fixed frames

with masking. The Ambient Visionaire Black material can't be used with roll-up or roll-down screens so far. That's subject to change in the future. For now, the AVBlack is only sold with fixed frames.

Ambient light-reduction projection screens are typically the best choice for people who know their front projection system will be used in a variety of lighting conditions, from total or near-total darkness to moderately bright. When you talk about ambient light rejection, you have to realize that the closer to the position/angle of the projector the ambient light source is, the less of that ambient light can be "rejected." Obviously, you don't want the projection screen to "reject" light from the projector, you want to use all of the projector's light as efficiently as possible. Examples of the worst possible light sources for rejection by ambient light-rejecting projection screens would be a window or lamp behind the projector or a lamp between the projector and the projection screen. Best case for ambient light rejection would be light coming from most any other direction than the direction of the projector. The more off-axis (off the projector-screen axis) the ambient light source is, the more it can be absorbed by the projection screen.

Ambient light may be more of an issue than you realize. In a room with light-colored walls, every light source can become multiple additional ambient light sources since you can have light from the original source bounce off the walls, ceiling, and floor back onto the projection screen. You want to reject light from all of those directions for a light-rejecting projection screen to be as effective as possible. Light from overhead recessed "can" lights is quite well rejected by this screen and could be one of the more common light sources in a multi-use family area. Light sources to the sides of the screen or below the screen are also very well absorbed by the screen. But there are limits to what an ambient light-rejecting screen can do, even a good one like the Black. If there is a window with bright daylight 3 to 10 feet to the side of the screen, that is an extremely bright-light source. The Black may look better than "lesser" light-rejecting screens, but the intensity of a bright, off-axis light source is likely to be so overpowering that you just can't get images that don't appear to be affected by the side-light. Also, even though this is an ambient light-rejecting screen, it can't look as good with the light in the room as it does with no light in the room. The purpose of light-rejecting screens in general is to make video nicely watchable with some light in the room, but the images will still be considerably better with no ambient light. The main goal is to keep ambient light from flooding the screen with light so bright you lose any sense of black existing in images. Ambient light-rejecting screens will improve contrast ratio when ambient light is present, compared to conventional projection screens.

One scenario that an ambient light-rejecting screen can help with is locations where you can't paint surfaces near the projection screen with flat, dark gray or black paint. You would end up with light bouncing off that nearby surface, with some going back onto the projection screen. That causes images to wash out and look muddy where the reflected light is strongest, usually affecting the area of the screen closest to that light-reflecting surface. I saw this in one home theatre, where the setup required the screen to be close to the white ceiling. The ceiling, even the area near the projector couldn't be painted flat black to stop the reflection from the ceiling killing contrast in the top 25 percent to 30 percent of the screen. But had an ambient light-rejection screen been specified, much of that light reflected off the ceiling would have been eliminated as a source of degrading images with excess reflected light.

Something else to keep in mind about ambient light-rejecting projection screens in general; they aren't magic. There's no such thing as a projection screen that rejects 100 percent of off-axis ambient light. Ambient light-rejecting screens reduce the problem of apparent image contrast being obliterated by reflected or direct ambient light, but there is no perfect fix for this problem. In fact, reducing ambient light helps images look better and better. Ambient light-rejecting screens' real job is to make images watchable, with much more contrast (or apparent contrast ratio) when there is some source or sources of light in the room. This is the sort of screen you want when the kids are up watching *Frozen* or *Star Wars* while they play with their action figures. Or when the family is watching *The Big Bang Theory* or *Modern Family* together while having ice cream for dessert. Once the kids go to bed, mom and dad can turn off the lights for some *Game Of Thrones* or *Downton Abbey* and enjoy prime quality images.

Installers and integrators may reflexively recommend rear projection for ambient light viewing situations, mostly because they may not have experienced how effective this Ambient Visionaire Black screen material is. I think the Ambient Visionaire Black, or one of the other Ambient Visionaire materials, could replace a lot of rear-projection setups where the location of ambient light sources favors the light-rejecting, front-projection screen materials. Certainly, there will still be times when rear projection is the only practical solution for projection, but Ambient Visionaire certainly provides an alternative in many cases.

One concern about projection screens in general is the real-world practicality of the projection screen material. If the screen is great at rejecting ambient light, but the surface is so delicate that removing even the slightest contamination damages the surface, that's not going to be a very useful projection screen material in a shared family area. The Ambient Visionaire Black screen material is completely covered with a clear protective layer that allows the projection screen to be cleaned with common household cleaners including isopropyl alcohol. [A note about isopropyl alcohol: The Seymour-Screen Excellence Web site says "rubbing alcohol" but be very careful. Products labeled rubbing alcohol may be "old school." Decades ago, alcohol was used for rubdowns/massages after strenuous activity. To avoid the drying effect alcohol has on skin (alcohol absorbs water directly from living cells, that's why liquor "burns" when you drink strong spirits) that type of "rubbing" alcohol contains lanolin, an oil from sheep. If the alcohol you want to use says "72 percent isopropyl alcohol" or something close to that, it may contain lanolin. Check the label carefully, lanolin will be indicated somewhere on the bottle if it is in the bottle. Lanolin in the alcohol will leave a hard-to-remove oily film behind when the alcohol evaporates. "Stronger" isopropyl alcohol will clean better and won't contain lanolin. If the isopropyl alcohol is labeled 91 percent to 93 percent isopropyl alcohol, it won't have lanolin in it.]

One of the problems I've seen in a variety of screen materials is a blob of graininess in the center of your vision. If you are looking at the center of the screen, it's in the center of the screen. If you look

SPECIFICATIONS

Features
Highest ambient light-absorbing screen available
Surface coating protects screen surface and allows cleaning
Screen tensioned in frame with elastic bands
Screen material size supports screens up to 60-inch image height
Fixed frame options include flat, curved, masked
Accurate luminance and color response

Specifications
Recommended viewing angle: Not more than 45 degrees off axis
Recommended minimum throw distance: Not less than two times screen width
Warranty: 10 years
Price: custom quote required for size/frame combination, but 96 inches wide 16:9 screen with rigid flat frame sells for $2,601

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left, the blob of graininess moves to the left. I never saw even a hint of that from the Ambient Visionaire Black. You also don't want the screen to add any kind of grain or texture to images. As pixels have gotten smaller and smaller, this is increasingly difficult for screen manufacturers to avoid. The Ambient Visionaire Black usually produced grainless, textureless images that look fabulous, but there is more on this subject in the image quality evaluations.

Subjective Image Quality Evaluation

I was seriously impressed by this projection screen. My first hours using this screen were in a dark room at night. Images were so close in appearance to the reference screen (Stewart Filmscreen StudioTek 100 reference screen with 1.0 gain), few "civilian" enthusiasts would ever notice the difference. For those of us afflicted with professional image quality training and decades of using that learned skill, it can be difficult to just relax and be entertained. There were some visible differences between the two screens, but they were arguably in the hair-splitting realm rather than being obvious or distracting in any way. I was honestly rather astonished that the Black screen didn't have more observable issues or differences compared to the reference screen. These observations apply equally to HD and UHD resolution. There were times when I focused on the image structure, deep into the projected images, rather than just looking at the images normally that I could detect a level of grain or pixel noise that was just a little more than what I'm used to seeing with the StudioTek 100 screen material. But if I could make myself stop doing the image evaluation thing and just focus on how good images look, the AVBlack did a yeoman's job of looking very close to the reference screen material. The grain appearance was most often present with satellite programming, often during commercials with graphics or "hyped" images, like a bowl of chicken soup that looks ten times better than any canned chicken soup looks in a white bowl. If I paused the frame when I saw the grain-y appearance, then moved the AVBlack screen out of the way and re-focused on the reference screen, the reference screen would show a hint of grain in the same paused image. This was using a projector with a visible pixel structure (tiny gaps between HD pixels). When I put the projector into pixel shift mode, where it produced pseudo-UHD resolution by offsetting a second set of pixels to "cover" the tiny gaps between pixels, making the pixel structure disappear, the appearance of the grain was greatly reduced. This grain wasn't as obvious as you might think, though. It was almost like you had to look "under" the pixels to see it. I'm not sure how else to describe it. If you just looked at the image for pleasure, without trying to find problems in the image, it was easy to completely miss this grain. But if you looked "into" specific elements in specific sorts of images, there was sometimes this grain which seemed to be coming from screen reflections where different pixels of white or yellow or red (most visible in these colors) were lighter or darker than their neighbors, maybe if even portions of a single pixel had different luminances. It was one of those things that I often questioned whether I was seeing it or not, and that led to many cases of removing the AVBlack screen and viewing the same image on the reference screen. The higher the quality of the source, the less often this appeared. HD Blu-ray, for example, didn't show the effect very often compared to the satellite TV STB. But there was another element to being able to see this effect—if I was simply enjoying the images without analyzing them, I didn't see the grain issue at all. I really had to look "hard" into the image to see this effect.

To be fair about this grain issue, the reference screen and maybe two other reference-grade screen materials with similar properties and blacked-out room requirements are the only screen materials I've ever used that minimize or entirely eliminate this effect. It seems to be visible on other screen materials when appropriate content is available that reveals it. Decades of ridiculous levels of formal image quality training and practice have sensitized me to this grain artifact. When I ask others if they see it, the answer is usually "no" unless I "train" them to see it. I will only show someone how to see this if asked to do so because once you see it, you can't stop seeing it. Most people would be happier never seeing it. It's difficult, in that context, to consider this a defect or shortcoming when it is part of the performance of most screens in use today. If I was comparing the AVBlack to some other screen material, there would be about a 75 percent chance that the AVBlack would be better than other (non-reference) screen materials in this regard. Not many people are willing to black-out a room completely in order to be able to use one of the few true reference screen materials that don't have any of the grain effect. That means most people are going to be choosing a screen from a pool of options that has little to a lot of tendency to look grainy at times.

With light coming into the room from the left side of the screen, behind the screen, and from a lamp to the right of the screen, contrast ratios remained respectable, producing very watchable images that were very significantly washed out on the reference screen. I'm not saying the contrast ratios were as good as in the darkened room, far from it. But compared to the reference screen, the AVBlack screen was many times better. Bear in mind that the reference screen is one of the worst possible screens for ambient light rejection, to the point that the manufacturer recommends using it only in a blacked-out room with the least reflective black walls, ceiling, and floor possible.

Two kinds of animation, photo-realistic (*The Jungle Book*) and more conventional computer-generated animation (*Zootopia*) both produced detailed and engrossing images. And those images were so good, my attempts to stay in critical evaluation mode kept failing, and I would find myself being carried along by the movie for 10 minutes or so before I'd remember I had a review in progress.

Live-action movies used during evaluations included *Mission Impossible: Rogue Nation* and *The Second Best Marigold Hotel*. Both followed the results of the animated titles, producing images that were so good it was difficult to remain critical. Color was everything I expect from a good screen, from saturated to pastel. Black-and-white content (*Casablanca*) was neutral and nuanced, just as you would expect from any good screen.

Casual TV viewing with lights on in the room was so much better than the reference screen, there was really no comparison. The lambertian reference screen washes out as soon as the smallest amount of room light is present, while the AVBlack does its job as promised. It's not that there was no evidence of lights being on in the room, it's a matter of how much less washed out the AVBlack looks. I have a floor lamp 16 inches to my left and slightly behind me, so it's fairly close to the axis of the projector, probably 9 or 10 degrees off-axis. This is fairly close to a worse-case light source for the AVBlack, but even that light source was much less of a problem for the AVBlack than for the reference screen. Of course, light sources more off-axis were much easier for the AVBlack screen to deal with.

Objective Image Quality Evaluation

Measurements confirmed specs listed for the Ambient Visionaire Black screen material. Measuring the screen at an angle very close to the light emitted by the projector produced a screen gain a bit over the 1.2 factory specification. The farther off-axis you move, the more light is lost, as expected. The viewing angle specification is 45 degrees to either side of center. Seymour-Screen Excellence follows industry practice by defining viewing angle as the point where the measured gain is half of the on-axis gain. That may sound like the screen would appear very dark, at 45 degrees off-axis, but that 50 percent drop in gain translates to just a 20 percent loss of luminance. So images viewed 45 degrees off-axis still appear usefully bright. With the on-axis measurement very close to 16 foot-Lamberts (fL), the theoretical off-axis luminance at 45 degrees would be 12.8 fL. I was getting more like 11 fL but moving the angle of the meter a little

would change measurements, so any variance I got could easily be due to differences in setup here versus at the factory.

The AVBlack material did return more blue light than the StudioTek 100 projection screen. Color temperature averaged about 220-degrees Kelvin towards blue, compared to the reference screen. This points out the value of calibrating your projection screen and projector together. The next question you may be thinking is, "Just how visible is a 220 degree difference in color temperature?" A fair question. If you had two gray scale ramps on-screen at the same time, with the only difference being one is 220 degrees Kelvin blue-er, you'd see the difference. But if you had to spend a few minutes changing screens to see two different versions of the same color scene, it would be nearly impossi`ble to see the difference. Black-and-white content would make the color temperature difference easier to see, but even then, without the side-by-side comparison, it's really difficult to see a 220-degree difference in color temperature. The AVBlack material produced a fairly tight color temp spread, from 20 percent to 100 percent, with all values measuring between 6,671 and 6,781, so just a 110-degree Kelvin spread. The reference screen produced the same spread, it was just spread above and below 6,500 degrees Kelvin.

There were only slight gamma variances between the two screens, the type of differences you get from meter-reading variations. The screens themselves had the same response to low, medium, and high luminance. Measuring the primary and secondary colors from 20 percent through 100 percent saturation in 20 percent steps produced the same results on both screens if you subtract out the slight blue bias of the AVBlack material. CalMAN's Color Checker measurement measures many different colors aside from primary and secondary colors; forest green, sky blue, oranges, browns, yellow-greens, purples, pastel colors, dark and light flesh tones, etc. Here, too, the AVBlack produced the same measurements, as long as you discard the slight shift to blue that would be removed by calibration.

Conclusion

The Ambient Visionaire Black 1.2 screen material would be an excellent choice in any theatre where front projection is desired over rear projection, for use in lighting conditions ranging from a completely dark room to a room with moderate amounts of ambient light. The structure of the Ambient Visionaire Black screen traps light impinging on the screen at "off" angles and absorbs that trapped light to maintain better contrast ratios than conventional screen materials in the room. It can't work miracles by rejecting 100 percent of all light not coming from the projector, but it does very obviously do exactly what Seymour-Screen Excellence claims it will do, reject significant amounts of off-axis ambient light, maintaining better image contrast ratios. Highly recommended for appropriate systems and applications. WSR