SIM2 Nero 4S
UHD/HDR Projector

Doug Blackburn

SIM2, BV was founded in Italy in 1995. Business expanded internationally fairly quickly, based on strong performance and a more satisfying external product design (compared to other projectors) to accompany the strong performance delivered by SIM2 products. Today, SIM2 projectors are available in at least 50 different countries. SIM2 has had to deal with the rapid changes and advancements in video technology that have happened since 1995… beginning with CRT projection, and transitioning to the UHD resolution and solid-state imagers that have taken over the industry in 2019. SIM2 makes projectors for home theatre but also has specially designed projectors for commercial use in simulators, control rooms, and information communication uses like presentation rooms/stages. SIM2 also owns the Brionvega brand that started in 1945 in Italy. That brand manufactures lifestyle audio products with unique Italian design. All of SIM2's current projectors use Texas Instruments DMD imaging devices with DLP chipsets. DMD/DLP projectors make up the majority of cinema projectors. SIM2 chose DMD/DLP projection for their home theatre projectors to create the cinema experience at home. SIM2 is also dedicated to excellence in customer service, whether end-user or installer/integrator. A key support feature is the remote diagnostic feature of the Nero 4S that allows your integrator/installer to connect directly to the projector to gather information about any potential problem. Should the integrator/installer need additional help, U.S. SIM2 support can also connect, and if needed, even SIM2 support in Italy could log in to the projector over the Internet. With an Ethernet connection to the Nero 4S projector, it can even be set up to send Emails to your dealer/installer. For illumination, SIM2 uses many of the illumination systems currently available including: UHP lamp, laser-phosphor, LED, and hybrid laser. SIM2 is also producing short-throw projectors with DMD/DLP technology.

The Nero 4S projector reviewed here is a UHD/HDR projector with a single UHD/HDR HDMI input and a second HDMI 1.4 input for HD inputs. The light source is a new Phillips ultra-bright 450-Watt UHP lamp that produces a factory spec of up to 6,000 lumens—brighter than any other projector I've reviewed. The external appearance of the projector is quite luxurious with black-glass surfaces everywhere with no ventilation required. Where ventilation is required, the inlets are disguised by panels with thin, evenly spaced "bars" that look like miniature heat sinks. The end result is a black rectangular enclosure finished almost completely in black with the black-glass surface having a very high-gloss and luxurious appearance. The silk screening on the front panel is impressively crisp in white and red. The model name is printed right side up and upside down so it is "right reading" whether the projector is on a rack/shelf right side up, or whether it is mounted upside down in a ceiling mount.

The Nero 4S projector is designed to be SIM2's brighter-than-usual home theatre UHD/HDR projector. I was a bit concerned that 6,000 lumens would overpower my room with light, but that turned out to be a non-issue. But all that light from the projector did produce some of the best UHD/HDR content I've seen from any projector. The Stewart Filmscreen StudioTek 100 reference screen would have been problematic had my theatre not been of the "black-out" style, due to the wide-angle reflected light that comes off this Lambertian screen. The acoustically transparent Seymour-Screen Excellence motorized masking screen with Neo Enlightor woven material was an excellent match for the Nero 4S projector. Its gain, close to 0.85, improved black-level performance slightly, and the projector's light-output capability was sufficient for UHD/HDR images to achieve spectacularly bright (for a projector) luminance levels that make HDR images look so compelling.

These images look so good, not because the image is incredibly bright, but because the peak levels for red, green, and blue are so high that the color space expands and peak or near-peak levels of red, green, and blue are sufficiently bright to reproduce much of the expanded color space that comes with the UHD/HDR format. You never see 100 percent white over large areas of a screen with UHD/HDR content since that would be uncomfortably bright. Think of UHD/HDR being a 0 to 50 percent white system with everything over 50 percent used to enhance color and create realistic highlights while retaining shadow and highlight detail. That said, I have encountered a few random places with different projectors or TVs where I've seen a full-screen 100 percent white in UHD/HDR mode. It's clearly a mistake for that to happen in any content since it's not a pleasant experience.

There is a second Nero 4S model available that's really two completely separate Nero 4S projectors stacked to have both operating at the same time, doubling the amount of light reaching the projection screen. The dual Nero 4S would be ideal for those seeking an impressive UHD/HDR experience on a large screen. The dual 4S setup is priced a bit lower than the cost of two "single" 4S projectors at $55,000. SIM2 says the maximum light output from the dual setup is greater than 10,000 lumens.

Using the SIM2 Nero 4S really didn't have any surprises. It performs just like any good projector with a UHP lamp, except the color space is larger and the extra luminance capability makes UHD/HDR appear at or near the top of the heap. For SDR content, you still want the usual 16 +/- 4 foot-Lamberts (fL) for 100 percent white, which is far below the maximum light output capability of the Nero 4S, so you can use the most economical lamp mode for HD/SDR content and extend the life of the UHP lamp considerably.

There is one feature of the Nero 4S I have never encountered before in a home theatre projector—an optical system optimized for light to travel directly through the center of the lens and to "hit" the projection screen near the center of the screen rather than aligning the lens near the top edge of the screen. SIM2 calls this a telecentric optical path. All elements in this lens are glass, and it is larger and heavier than lenses that come with less-expensive projectors. For most installations, this means the projector will have to be mounted lower than usual, or the projection screen may need to be placed higher than usual, or perhaps a little of both. The "different" projector location will require some advance planning to make sure seating, especially elevated rows behind the front row, doesn't interfere with the light path. SIM2 says the lens is optimized for best performance knowing the images would be travelling through the center of the lens optics. Close examination of the pixel pattern on-screen revealed that the visible pixel structure remains visible way out to the sides and corners of the screen. The visible pixel structure has a very fine line between pixels (horizontal and vertical). It's typical to see the pixel structure not be very well focused at the edges and corners of the screen, but the Nero 4S produces a sharp image with good contrast over the entire screen. This makes UHD/HDR images more impressive than projectors that are "softer" around the perimeter of the screen than they are in the center. Often that softness at the edges is accompanied by a loss of contrast compared with the center of the screen, but that too is not visible with the Nero 4S, giving images a sharper look even when you aren't looking directly at the center of the screen. The lens has a 2:1 zoom ratio for flexible placement options.

While the SIM2 Nero 4S has motorized zoom and focus, I was initially taken aback by the manual vertical and horizontal shift

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Features—SIM2 Nero 4S UHD Projector
Super high-definition all-glass lens
New, high-precision telecentric optical path
1-chip DMD (DLP device)
UHD image resolution
4 HDR presets for different screen sizes
Fully automated SDR-HDR-SDR transitions
Full color volume adjustments
Live Color Calibration software (LCC)
2x zoom lens
Remote info function (SIM2 Customer Care 4)
SIM2 Perfect Fit feature makes easy setup for different aspect ratios
10 Memories for lens position, focus, image shift
Adjustable iris
Factory light output spec of 6,000 lumens
Projection lamp type: 450-Watt UHP
Recommended screen size range: 100 to 160 inches
Motorized zoom and focus
Manual mechanical wide-range image shift for horizontal and vertical
Digital image shift allows moving image within unused areas of DMD device
Inputs: one D-sub 15; two HDMI 1.4a/HDCP 1.4; one HDMI 2.0a/HDCP 2.2; one Display Port 1.2; Ethernet (command/control); wired IR; USB (firmware updates); RS-232 (control); one 12 VDC trigger
Outputs: one HDMI 1.4a/HDCP 1.4; one 12 VDC trigger OUT
Operational Altitude: 0 – 10,000 (feet)
LAN control for: Crestron, Extron, PJLink, AMX
IR remote control included
Keypad on back of projector
Accepts 3,840 or 4,096 pixels horizontally, but 4,096 sources are "trimmed" to 3,840 for display

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adjustments that require inserting an included Allen wrench through tiny holes in the black glass faceplate to engage the adjustment screw in the hole. Turning the Allen wrench raises and lowers or moves the image left and right as needed. For reviewers using multiple screens, this is a little annoying. For home theatre installations, the owner will likely never know those adjustments are manual, since the installer will do the adjustments. Unless the screen is moved or replaced, the shift adjustments won't be used after the initial setup.

The DMD chip that is the heart of DLP projectors is the 2716x1528 single-chip model that requires a spinning color wheel. The days of DLP projectors producing rainbow artifacts are over unless you are hyper-sensitive to this effect. These days, the color wheel spins so fast and frames refresh so fast that the rainbow problems widely reported in the early years of DMD/DLP projectors just aren't much of an issue any more. I never once saw a rainbow artifact during the review.

For UHD sources, the 2716 x 1528 imager flashes half the pixels in the frame, 4.15 million of them. A second frame flash displays the second set of 4.15 pixels to complete displaying the 8.3-million pixel original image. This means all 8.3 million pixels in each UHD movie frame are reproduced by the Nero 4S, it just takes two frame flashes to do that instead of displaying all 8.3 million pixels for each frame flash if the imager has a native resolution of at least 3840 x 2160. This DMD device can operate up to 120 Hz, so 24p movies get four flashes for each frame for a 96 Hz

EQUIPMENT REVIEW

SIM2 Nero 4S UHD/HDR Projector

refresh rate. 30p content can be flashed four times per frame to use the full 120-Hz refresh rate. And 60i or 60p content can be flashed two times per frame to use the full 120-Hz refresh rate. We used the interlaced NTSC standard for decades. It relied on our brains' ability to "knit" two half-frames (odd-numbered scan lines in one frame, even-numbered scan lines in the next frame) together to create a single image in our heads. The dual flash of the Nero 4S works for the same reason. UHD images really do appear to have all the resolution present on UHD discs, and combined with the exceptional luminance capability of the Nero 4S, the result is impressive UHD and UHD/HDR images.

Connections available on the Nero 4S include: the 15-Amp IEC power cord socket; two v1.4 HDMI inputs; one v2.0 HDMI input; one HDMI output v1.4; Display Port 1.2 input; 15-pin d-sub connector for PC video; Ethernet port for command/control and remote diagnostics; USB-A connection for 5VDC/1.5A power and for firmware updates; RS-232 port for control and firmware updates; two 12VDC triggers; and a wired infrared control mini-jack. The back panel has projector control buttons that are useful if you need to change something and a remote control device isn't handy. Cooling air is drawn in on the left side of the projector, while hotter air exits out the back of the projector.

The remote control isn't likely to be used in most systems that employ a Nero 4S in favor of some sort of control system. But it's a useful remote with 28 buttons, 27 of which are backlit. Menu navigation is easy, and additional buttons access settings that are used most often.

SIM2 projectors are available through all authorized SIM2 dealers. These dealers design and build custom home theatres, are custom installers and system integrators. DIY enthusiast customers in the U.S. who wish to own a SIM2 high-end projector can contact SIM2's designated direct sales agent Alan Gouger with DCI-Central in Bradenton, Florida (full contact information listed with SIM2 address).

SIM2 calls their lens memory system Perfect Fit. If you use a 2.40:1 aspect ratio projection screen (or other wide aspect ratio format), you can save as many as ten combinations of settings for focus, zoom, and image shift. With manual adjustments for mechanical shift vertical or horizontal, SIM2 needed another way to allow moving the image around on-screen to get it centered on a wide-format screen so every aspect ratio fills the screen top to bottom. Image shift moves the image in relationship to the DMD micro-mirror device. When you have a 2.35:1 movie, all the "black bar" space can be used to move the image up and down to get it centered on the wide aspect ratio screen. Left and right image shift is limited to perhaps a few lines of pixels on the left and right. It is recommended for this Perfect Fit system to work properly, the left-right axis of the screen should be perfectly aligned with the center of the projection lens. If the projector is off-center or tilted to get the picture to fill the screen, repositioning reliably will not be good when you use the Perfect Fit feature. There are F1, F2, and F3 buttons on the IR remote control. Those buttons directly access Lens Memory 1, 2, and 3 respectively. If you set Memory 1 to 16:9, Memory 2 to 1.85:1 (many dramas, comedies, and animated movies), and Memory 3 to 2.35 or 2.40 aspect, you won't have to navigate to the lens memory settings page very often. Of course, integrated control systems can change memories without the user having to do or remember anything… just press a button.

SIM2 has heavily revised the HDR performance of the Nero 4S series due to recent improvements in HDR standards for projectors. This has happened in response to a few years of HDR with little or no guidance for projectors. All the technical aspects of early HDR were focused on flat panel TVs that are typically much brighter than any projector. Finally, some standards and options are out there to address HDR on projectors. Based on what I saw while viewing HDR content on the Nero 4S, SIM2 has done an excellent job of making HDR look good on this projector—better than previous generations of projectors.

SIM2's Pure Engine consists of three sets of adjustments. Ultra Detail is an edge-enhancement setting that can produce visible artifacts if set too high. Use a Sharpness test pattern to explore the proper setting for this control. Pure Color allows color to be processed to make color more vivid. This is typically not a control to use if your intent is to make the images as accurate as possible. Instead, this control is intended to make images more colorful rather than more accurate. Finally, there is Pure Motion with processing to improve motion quality. Since DMD/DLP imagers have excellent natural motion quality, the degree of improvement you get with this control is smaller than the improvement you may be used to experiencing in projectors with LCD or LCoS imagers. None of the settings produces motion with visible problems, but

"...The Nero 4S Is One Of The Most Satisfying UHD/HDR Projectors I've Used At Any Price."

the images can be even sharper during motion if you use the Medium or High setting. Low produces a subtle improvement in motion quality. Interestingly, when using the highest setting for making smooth motion on LCD/LCoS projectors, while motion quality is improved, there is a fairly obvious *feel* to those images that people have come to call SOE or soap opera effect after soaps that were shot on video while other entertainment of that era was recorded on film. If you use the High setting on the Nero 4S, you just get clearer motion without obvious SOE. The result can appear startlingly like real-life motion.

SIM2 supports a wide range of control systems with both control options (Ethernet, RS-232, wired IR, etc.) and on-board support for the following commercial automation systems: Crestron, Extron, PJLink, AMX, and a generic HTTP (Web) control option. While I almost always avoid using settings that have Dynamic or Automatic in the name of the control, Dynamic Contrast on the Nero 4S is useful to help reduce apparent black levels when scenes get darker. This functions like an Auto Iris control to lower luminance in dark scenes and to increase luminance of bright scenes. I used this control most of the time and found it to be useful, though, it was occasionally "visible" when luminance was reduced or increased. Some people dislike that and never want to see it happen. Each user will need to decide whether they want to use Dynamic Contrast or not. Certainly, this control has to be set to Off during any calibration work.

The Nero 4S has calibration controls that have become almost standard in a wide range of video displays. They're the normal gain/bias controls that can improve RGB balance and gamma and color calibration controls for RGBCMY. In addition, SIM2 has LCC calibration software that runs on a PC and works with SIM2 projectors. Gamma settings include presets for 1.8, 2.0, 2.2, and 2.4 plus settings labeled Film, Video, and Graphics. There are color temperature settings for D55, D65, D75, D83, D93 and Native. D65 was closest to 6,500K color temperature. There is a manual iris control that remembers settings you use in different modes. That way, when you want SDR content to follow the SMPTE guideline for 16 fL for 100 percent white, you can reduce Contrast a bit and close the lens aperture a bit so you aren't relying on the digital processing too much to make the images less bright than the projector is capable of doing.

SIM2 has positioned the Nero 4S as a premium UHD/HDR projector. They have focused all efforts on creating the best possible UHD/HDR image quality with images bright enough to make the new HDR for projectors standards look as good as possible. To that end, they did not enable 3D, which has no UHD/HDR counterpart. SIM2 did not ignore 1080i, 1080p and 720p image quality, all those formats look great on the Nero 4S, they simply chose not to complicate things with 3D.

There is a digital zoom control, but I can't recommend using this control at any time since it will cause the projector to process fewer and fewer pixels into a 3840 x 2160 image. It might come in handy for some random uses, but remember to turn it off when you are done to get the best possible image quality. Image Shift, however, is completely non-destructive in spite of its digital nature. However, making large adjustments in the wrong aspect/resolution can result in loss of parts of your image. You can keep adjusting the image, even after you begin losing rows or columns of pixels. You have to pay attention to what you are doing with this control.

Subjective Viewing

Frankly, until the Nero 4S, I've been a bit underwhelmed about the appearance of 4K/UHD Blu-ray discs on home theatre projectors. As it turns out, much of that disappointment has been because the HDR standards really don't work for projection. It has been a long time coming, but finally there are different parameters for projectors reproducing 4K/UHD/HDR content. That can only mean better days for projectors capable of HDR playback. In fact, the Nero 4S is one of the most satisfying UHD/HDR projectors I've used at any price. Colors and detail are excellent with no sense that the 4.15 million pixel DMD imager is double-flashing each frame to display all 8.3 million pixels in UHD images.

DMD/DLP projectors, even with this new chip set, continue to have black levels that are considerably more elevated than black levels associated with LCoS imagers. As long as the installer/designer is aware of this, steps can be taken to reduce the apparent black level to acceptable levels once the system/install is complete. The better black level (LCoS) versus better motion quality (DLP) debate will continue to live on since there is no one current imaging technology that produces better black levels and better motion quality at the same time. I missed the dark black levels delivered by LCoS projectors immediately, but within 15 minutes of using the Nero 4S I had reminded myself about how natural motion looks on DLP projectors, and that dampened my disappointment about the black level.

Sending HD Blu-ray content to the Nero 4S produces very satisfying images. There's plenty of detail, no visible artifacts, and the quality of motion is excellent. Most of the content I viewed in 720p, 1080p, or 1080i was TV programming or movies that aren't typically released on 4K/UHD discs, like dramas and comedies. The Nero 4S made these movies look better than they do on native HD resolution projectors by improving the smoothness of edges, whether high-contrast or low contrast (like two different colors touching along some sort of edge). Edges of HD content look like edges in UHD content. The rest of the detail in HD images comes through fine, though, without as much enhancement as edges. In

addition, that great motion quality made many scenes look more like real life images, to the point that many times it was very close to real-life motion quality on-screen.

UHD/HDR movies were, if not the best UHD/HDR projected images I've seen, very, very close to the best. The remastered version of *2001: A Space Odyssey* was an endless wonder for seeing more detail in images than I remember seeing from 70-mm prints in movie theatres when the movie was originally released. Of course, back then I was a 17-year-old college freshman, three months from my 18th birthday. I had nearly zero knowledge of image quality at that point, but even then, the superiority of the 70-mm version of the movie was obvious after seeing a 35-mm print at a different theatre that had an indifferent sound system. On the Nero 4S, rock textures and the hair on the man-apes were stunning, with even sun-reflection effects on the black hair being very realistic. There was subtle shading in the obelisk I don't remember seeing before, and something about the shading made the obelisk look smoother, but not glossier, than I remember it ever looking in theatres or on HD disc. The sharp edges on the obelisk were also hyper-sharp in this UHD/HDR version. The shuttle ride to the space station was loaded with new insights into textures in the cabin attendants' clothing, including their *used-looking* grippy zero-gravity slippers. Surfaces and details looked impressive and were not made to look like cheap movie sets/props as is all too common in older movies with lower production budgets than Director Stanley Kubrick had for *2001*. The Nero 4S delivers compelling HDR enhancement. Motion was better than any previous version I can recall. There was such precision in motion and timing from the Nero 4S you could detect tiny imprecisions in the motion of some of the SFX models of the space station and spaceships. The new remastering removes all of the horizontal and vertical wander that was common from film projectors and in film prints made from film masters. The motion quality of the Nero 4S was a fantastic complement to any and all motion in the movie, whether it happens in normal gravity or in weightlessness.

The BBC documentary series *Blue Planet* was fascinating to view on the Nero 4S because, again, that motion quality advantage was obvious in every scene, other than those like the vertical-sleeping sperm whales where there's only very slow on-screen motion. The colors of the sea life were to die for, with reefs looking so natural you could almost imagine touching them through the screen. The smallest details in fish, from scales to the thin ribs in large and small fins were amazing. When sunlight combined with choppy surface conditions, the result was an underwater light flicker show that dappled the reef with ever-changing patterns of light and dark. That particular scene is incredibly challenging for LCD/LCoS imagers because of the flickering light, high levels of detail in the corals, and lots of fish swimming around. It can be quite a blur-fest, but on the Nero 4S it was the same experience I had while snorkeling, with all the detail you'd see in real life. The entire viewing experience was incredible, in spite of the fact that I have viewed portions of this series on probably seven or eight projectors so far.

Valerian And The City Of 1000 Planets only has a 2K digital intermediate, but the color space and HDR on the 4K/UHD disc were used to great effect, giving this movie some truly reference-quality scenes from the point of color and the use of light. There is a brief scene with multi-colored clouds over a rugged dry old-west looking landscape. Something about the way the Nero 4S reproduced that scene made the multi-color clouds and rocks below

look three dimensional and very visually compelling. Other scenes, where the entire frame changed every one second or so, revealed so much more detail than I remember seeing before that I had to review those scenes more than once just to see how well they can be done.

I gave *Jurassic World: Fallen Kingdom* kind of a write-off after the first viewing shortly after release on disc, to the point that I didn't return to it until this review. But everything about the motion, detail, color, and texture of everything got me much more involved in the second viewing that started out just to be 10 minutes or so of looking at specific scenes but became a matinee. The storyline didn't improve (though it wasn't so bothersome the second time around either), but everything else did and that made the storyline less of a problem. Subtle reflections in the hamster-ball surfaces made it appear much more dimensional, and even when it was CGI'd into an action sequence, it still seemed like a real object. Dinosaur skin, talons, eyes, teeth, and other details were spooky-real looking with the Nero 4S.

The frantic action in much of *Ready Player One* was elevated to can't-look-away status by the Nero 4S. Every time I would try to look at just one scene, I had to keep going for half an hour or more just to experience the smoothness and naturalness of all the CGI motion. Again, the Nero 4S sucks you into the environment of the movie because it seems like a real place in there and not something being reproduced. I suspect this effect is a combination of the high-light-output capability of the Nero 4S, the superior natural motion quality, the quality of the light engine and optical path, and the ability of the projector to simulate reality on the projection screen.

Controls, Settings, Measurements

While investigating how various controls worked, there weren't too many surprises, but Contrast and Brilliant Color are two settings worthy of discussion. As many know, the Contrast control typically sets how bright 100 percent white gets. That does happen with Nero 4S also, but… you have to check the rendering of stepped ramp patterns with 20 or more steps from black to white. Contrast control settings close to the "0" default setting are okay, but higher and lower settings can visibly clip highlight detail. SIM2 mentions this in the Owner's Manual, so they aren't trying to ignore the behavior of the Contrast control. It was great to mention it in the Owner's Manual, where hopefully, calibrators see it before assuming it works like 95 percent of the other Contrast controls out there. You can't just pick any Contrast setting and assume it is okay, you really need to look at a gray scale ramp pattern with 20 or more steps to find your best Contrast setting options. You will be looking for highlight steps to be clipped at the same level as 100 percent white if you use a bad Contrast setting, while all highlight steps will be visible with a good Contrast setting. Because BrilliantColor interacts with luminance, there may be some interaction between BrilliantColor and Contrast, but I didn't take time to investigate that possibility.

The BrilliantColor setting initially sounded like a setting to avoid. I measured 100 percent saturation for RGB in BT.709 color space and got a great result, so why would I need color to be more brilliant? But when measuring UHD/HDR, I was quite surprised that if I set up the Nero 4S for maximum light output, I was only getting 75 or so fL for peak white while using the lowest BrilliantColor setting. When I set BrilliantColor higher and higher while measuring

BT.2020/DCI/P3/PQ test patterns, the peak white measurement kept getting brighter and brighter, topping out in the 85-fL to 90-fL range. You definitely want to use a high setting for BrilliantColor when viewing UHD/HDR content.

Color Temperature was closest to 6,500K when using the D65 setting. Color temperature measurements averaged 6,800K before calibration and close to 6,500K after calibration. There is a Color Gamut setting that actually does change color gamut. The Native option abandons all attempts at making the light output accurate. Cinema mode is for sources using the cinema DCI color space, something not available to the general public for home theatre use. Most owners will never use this feature—though some who work in the movie industry may need this function to screen content at home or in an office/studio setting. HDTV mode is claimed to optimize HD sources, LCC mode is the mode you select if you calibrated the SIM2 Nero 4S projector with SIM2's LCC calibration software (offered free to SIM2 owners who have calibration hardware and know how to use it). User mode is for Bt.709 color space and UserHDR is for BT.2020/DCI/P3/PQ content. Interestingly, when you are receiving a UHD/HDR video, the UserHDR color space option is not there. When you switch to a UHD/HDR source, the UserHDR color space option appears. I used User and UserHDR modes for most of the review.

When you use User mode for BT.709 content, and UserHDR mode for BT.2020/DCI/P3/PQ, you get an adjustment you wouldn't see otherwise, Dynamic Range. Again, this sounds like a control you might want to avoid, but it is actually useful. SDR mode is self-explanatory. But there are HDR1, HDR2, HDR3, and HDR4 settings also. These settings help owners/installers get the best result on different screen sizes. HDR4 is for screens that are 160 inches wide or more, HDR3 is for screens 140 inches wide. HDR2 is for screens 120 inches wide, and HDR1 is for screens 100 inches wide with the projector's lens set to the widest zoom option that makes images their brightest. With the 110-inch-wide 2.35:1 aspect Seymour-Screen Excellence Enlightor Neo screen with motorized masking, I felt the HDR1 setting gave me the best-looking HDR images. The motorized masking removed the distraction of unused white screen area for content with aspect ratios lower than 2.35:1.

SIM2 uses Dynamic Mode, where many other projectors use Picture Mode for a similar setting. These shouldn't be confused with the Color Gamut setting mentioned earlier. There are Dynamic Mode settings called Natural (reference quality), Dynamic (for PowerPoint, etc.), Bright (favors bright picture over accurate picture), Cinema (home theatre default settings), Sport (games and sports programs, reduced latency mode), HDR (preset), and finally User and UserHDR settings that allow customizing of all adjustable settings. The Sharpness control should be used at a very low setting or not used at all. Gamma settings turned out to not be terribly useful. There are settings for Film, Video (2.6), PC Graphics, Standard (2.2), 1.8, 2.0, and 2.4. As usual, select the setting that produces images where the midtones are properly balanced with the shadows and highlights. These optional settings can make the midtones darker or lighter than you want them.

There is a manual setting for lens iris opening size. I used 7 for HD/SDR and all the way open (12) for UHD/HDR. Dynamic Contrast darkens the luminance in dark scenes while increasing luminance in bright scenes.   The Pure Engine feature of the Nero 4S has three settings: Ultra Detail is an edge enhancement setting that should be used carefully, as higher settings produce artifacts

in the image. A Sharpness Evaluation pattern should be the guide to find the right setting. PureColor is a color processing setting that makes colors more vivid as you increase the setting. PureMotion is the frame interpolation mode, and as mentioned before, it works very well. I used High most of the time and enjoyed the "real" look it gives to movies and TV programs. Movies or TV programs shot with digital cameras were especially real-looking with the medium or high setting.

SIM2 Nero 4S Rec709 SDR
2D Grayscale Tracking Error
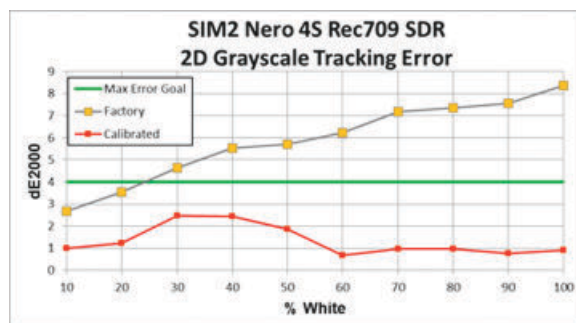
Gray scale tracking was good with responsive controls for gain and bias on the Nero 4S. Instead of the usual Hue, Saturation, Luminance controls present in most TVs and projectors, SIM2 has x, y, and Brightness (luminance) controls. The x parameter moves the measured point horizontally on the CIE chart, while the y parameter moves the measured point vertically.


SIM2 Nero 4S Rec709 SDR
2D Gamma
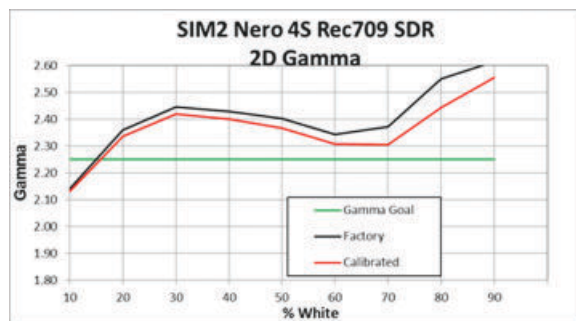
HD gamma measurements mostly shared this general shape. This measurement was taken with the 2.4 gamma setting. The 2.2 option made midtones look a bit too bright (moved the measured gamma lower, below the green reference line). There were no on-board controls that affected this gamma curve shape significantly. In spite of the shape of the gamma curve, images looked fantastic. Those desiring more precision in their gamma results could achieve more or less perfect gamma using a Lumagen Radiance Pro video processor that can tune gray scale levels with great precision via conventional adjustments or via the creation of a 3D LUT that makes the entire color space accurate, not just a couple of points for each color being made accurate.

SIM2 Nero 4S
### 2D Grayscale Tracking 1080p Rec. 709

| % White	Factory °K	Calibrated °K	Rounded Factory dE2000	Rounded Calibrated dE2000
10	7072	6526	3	1
20	6774	6456	4	1
30	6761	6479	5	2
40	6824	6408	6	2
50	6787	6415	6	2
60	6874	6530	6	1
70	6733	6438	7	1
80	6842	6, 502	7	1
90	6859	6479	8	1
100	6807	6599	8	1

The data table shows that the pre-calibration D65 white point setting was closer to 6,800K, but after calibration it came much closer to 6,500K.
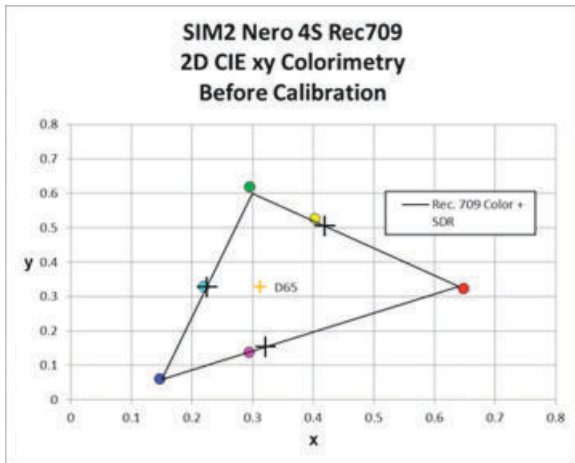

The before-calibration chart of HD colorimetry shows small to moderate errors in all six colors, RGBCMY. These errors were not so large as to be obvious on unfamiliar content, but viewing things that were very familiar it was possible to notice errors in some colors. This graph only shows the xy measurement for each of the six colors. Not shown is color brightness or color luminance (same meaning). All six of these colors were considerably brighter than they should be when the projector arrived, in the range of 50 percent to 200 percent brighter. None of the brightness/luminance error is reflected in this graph. I was able to remove all of the excess brightness/luminance for all six colors using the internal calibration controls.
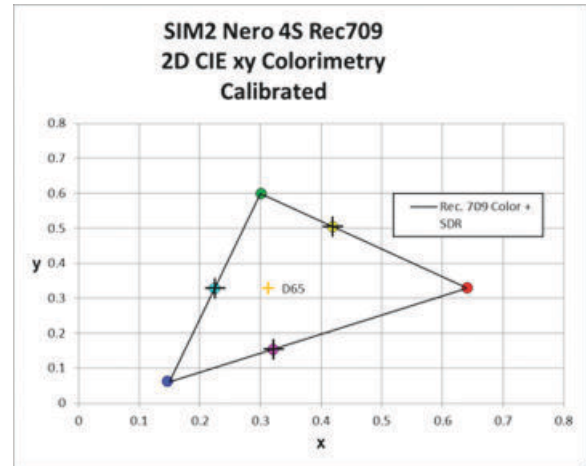
The calibrated colorimetry chart for HD video looks darn near perfect. Here, blue is slightly "above" the acute angle of the color-space triangle, but the error is relatively small.
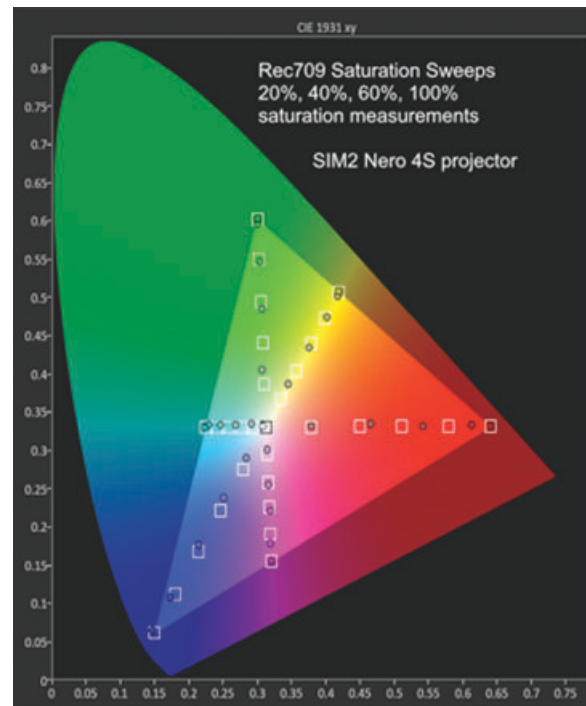
The saturation sweep chart for HD video is the after-calibration result. The 100 percent points for RGBCMY are around the perimeter of the triangle. These are all quite accurate as shown here and in the after-calibration colorimetry chart above. The interesting measurements here are the intermediate steps that are measured. If you look closely, you'll see a red dot in the center of the white square at the red tip of the triangle. The next red dot to the left is 80 percent saturation. It is supposed to measure inside the white box to its left, not in-between the 80 percent box and 100 percent box. This means that while 100 percent red is proper-

SIM2 Nero 4S

UHD/HDR
Saturation Sweeps
After Calibration
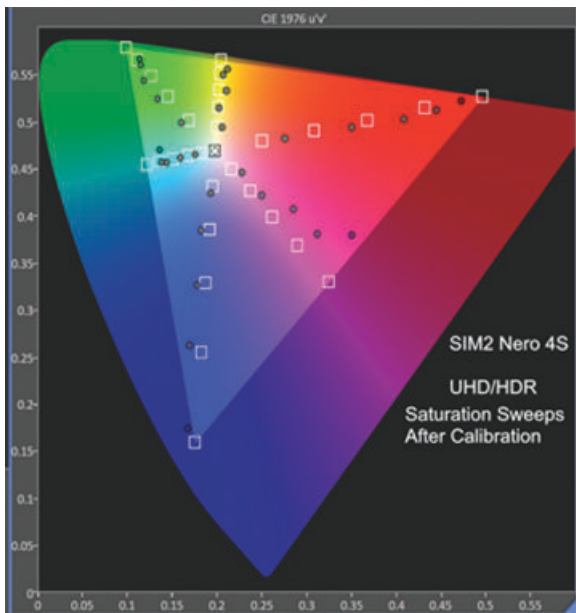
ly saturated, 80 percent, 60 percent, and 40 percent red are all oversaturated. But 20 percent red measured inside the 20 percent white reference box, where it belongs. Note that green and cyan have the 80 percent saturation points almost on top of their 100 percent measurement. There were no controls for this on the Nero 4S, but this is another issue that could be calibrated out with a Lumagen Radiance Pro video processor.

UHD/HDR measurements started with gray scale. It looks so much like the HD gray scale, I didn't see a need to reproduce an image here. What is most interesting about the UHD/HDR gray scale is how bright you can get the projector for UHD/HDR. I was able to achieve 90 fL (270 nits) with slightly more green than I would normally leave. Reducing the green content of the light reduced peak white to 85 fL. Setting BrilliantColor to the minimum setting further reduced peak white to close to 70 fL. Projector HDR needs different standards to help projectors make impressive HDR images. Showing the ST2084 EOTF curve is fairly meaningless for projectors since that EOTF is prioritized for flat panel displays that can get much brighter than projectors.
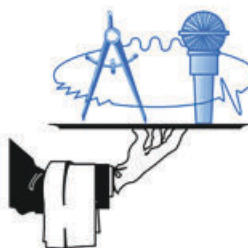
The UHD/HDR Saturation Sweeps chart shows some bending of colors as the Nero 4S runs out of saturation adjustment range. This is another place where a Lumagen Radiance Pro video processor can assist with improving color accuracy. This chart shows DCI/P3 color space with BT.2020 coordinates and a D65 white point. This is the color space (inside the triangle) that is used

for UHD/HDR content. You can see that RGCMY all miss their 100 percent saturation points. All projectors with UHP lamps produce this sort of measurement result. Even displays I've measured that claim to reach all of 2020/DCI/P3 color space typically miss their 100 percent saturation and 100 percent luminance reference points by a small amount. You may notice that the 80 percent saturation measurements for Y, C, and G kind of pile up behind the 100 percent point. In cyan, the 80 percent and 100 percent measurements are side by side. This is a common thing when a projector can't quite deliver 100 percent saturation. All that said, none of these errors was remotely obvious when viewing content. UHD/HDR discs looked great in spite of these small "misses."

Conclusion

SIM2's Nero 4S projector is strong competition in the $25,000 to $45,000 range. It is brighter than projectors in that price range that use laser-phosphor imaging systems or UHP lamps. The range of custom install features is impressive. The motion quality is to die for. The projector was problem-free for the entire two-month-plus review period, with hundreds of hours of serious and casual viewing. The Nero 4S would be right at home in any premium home theatre. **WSR**