

AccuCal™

Audio/Video Reviews

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Brilliant™ 6501mB LCoS™ HDTV Monitor

Highlights:

Pros:

- Blacks that are dark enough to satisfy most people.
- Bright images that work well in normal room lighting.
- Excellent color reproduction.
- Easy personal computer interface through VGA input port.

Cons:

- Fan is a little too loud for low volume levels.
- Screen and/or mirror imperfections are distracting on some bright scenes.
- Expensive compared to other 720p rear projection televisions.
- No ATSC tuner is included in this model.

Performance Rating*

Colors	4.5
Bright Image	5
Dark Image	4
Image Artifacts	4
Image Details	4
User Features	5
Connectivity	4

* Maximum rating is 5

Overview

The Brilliant 6501mB is the first rear projection television made by Brilliant. It features LCoS (Liquid Crystal on Silicon) technology that is very similar to the highly acclaimed Sony Qualia 006. The biggest difference being this display is 720p (1280x720) instead of 1080p (1920x1080) like the Qualia. However, don't let this stop you from considering this display. The difference in how this display will look compared to the Qualia in day to day use is very small and the Brilliant may actually be better for some people.

LCoS is a technology that appears to be coming into its age. It is very quick to respond resulting in few motion artifacts. The current three chip versions also avoid the significant problems of using a color wheel to achieve a color image. Black levels that can satisfy all, but the pickiest of consumers is another big plus. LCoS as a technology is a real contender for the HDTV champion of 2005.

Summary

With an MSRP of \$7999 this is one of the most expensive rear projection televisions on the market. After calibrating and watching it for an extended period I find this to be a very compelling product. Many people will beg the question, "How does it compare to its competitors LCoS products, the Sony Qualia 006 or the recent 720p JVC D-ILA?" Based on what I have seen I would say it is priced appropriately in between those two. I prefer the Qualia 006 because it is 1080p, quieter, has an amazing high quality projection system and is very sexy looking. The JVC D-ILA rear projection televisions I have calibrated do not hold a candle to this Brilliant or the Qualia and they belong at a much lower price point.

The Brilliant 6501mB has the best overall HDTV picture of any 720p rear projection television that I have seen. It has images that are very smooth and lacks a digitized or smeared look that many pixel based displays possess. However, when the broadcast or DVD has a pixilated look you will see it. When I watch this TV I frequently get the feeling I am really looking at what is being broadcast or on the DVD instead of something that is veiled by excessive processing.

Interfacing to computers is where this set really shines. The 6501mB is setup to be a computer monitor unlike the Qualia 006 which is intended for video, but can be coaxed into accepting a computer input. The reason this display is a very capable monitor is it has a VGA input that accepts multiple resolutions and can bypass the internal scaler which is critical for very sharp text.

Unfortunately, it is not perfect like every other display I have seen. The internal fans make enough noise that when the volume is low it easily is the loudest thing in my room when the HVAC is not on. It also has some slight unevenness from anomalies in the screen or mirror assembly. Other problems pointed out in this article would not deter me from owning it, but are included for completeness.

Anyone in the market for a high quality HDTV or wants an excellent large computer monitor should strongly consider the Brilliant 6501m/iB.



Specifications:

General

- 1280x720p effective resolution
- 65-inch diagonal
- 16:9 widescreen display ratio
- 112 pounds
- 59.5 inches wide
- 23 inches deep
- 270 watts maximum power consumption

Video Inputs

- One DVI input (rear)
- One VGA input (rear)
- Two 1080i/720p/480p component inputs (rear)
- One 480i component input (rear)
- Two S-Video (rear)
- One S-Video (side)
- Two Composite Video (rear)
- One Composite Video (side)
- Two NTSC antenna inputs

Setup

Setting up a display requires proper placement, source hookup and adjustment of the user settings. This TV has excellent flexibility in the user menu and very good visibility from the sides. It does not perform as well when looking at it from above or below. Because of this it is important to place the display such that your eye height will be fairly close to the center to avoid the top and bottom from looking noticeably dimmer than the center. This is more important the closer you are to the television. Viewing from the side is very pleasant as long as you are not too high or low relative to the screen.

This display needs to be slightly elevated to properly display the image. I used a 22 1/2" high BDI Axis 8024 stand for this review which was too tall if you want to view this TV at its best. I would recommend using a 10" high stand to present this display at its best from a normal seating position. My BDI stand was also a little too narrow allowing the base to slightly hang over the edge on the sides. Sitting closer than 8 feet from display this will cause problems with uneven screen illumination. Surprisingly, it is not resolution that is the problem at this distance.



Left Side Input Panel

Based on tests conducted on various inputs the VGA and DVI inputs look best for a 720p source which is a perfect fit for a computer. Other sources can be connected to the remaining inputs with little care about image degradation. The only exception are sources that are 480i component. These include your high end cable, off-the-air (OTA) set-top-boxes (STB) and interlaced DVD players that use the component connection (the connection with three RCA plugs). Inputs #4 and #5 do not have the best deinterlacer, but they do a credible job with a 480i input. Input #1 is a component input and it has a high quality deinterlacer that is the preferred input for that type. You may want to setup an HDTV STB such that it does not output 480i or you may want to route that output to input #1 for 480i component sources and to a higher resolution input when you want to view HDTV.

Each input has separate settings for picture quality. This allows you to optimize the picture for each input. Each input can have up to three sets of settings depending on the mode selected which is Day, Night or Custom. Day and Night mode can also be password protected if desired. The settings available include many of the common ones, but also include filtering, image size, gamma, RGB contrast/brightness, color temperature and color space.

I really like the filter option available in this television. It is dramatically different than the typical sharpness setting found in most televisions that just corrupts a video image if set poorly. The filter also does nothing when you feed the TV its native resolution (720p). I wish more manufacturers would follow this approach.

Gamma allows you to select how the display responds to an input signal. The choices are between three preprogrammed curves and 30 user adjustable curves offering the user huge flexibility. The user/professional adjustable curves require setting 195 different values and require specialized equipment and the knowledge to set properly.

The color space setting allows you to choose what type of signal is coming into the television. This can be set to Auto or Manual allowing the user to override the default assumptions. This is useful for some devices that output SD color matrix at HD resolutions. An example of this are some of the DVD players that can scale the image to 720p or 1080i, but do not convert the color matrix.

Video Resolution

The electronics in this television are consistent with a display that is intended to be used as a computer monitor as well. The biggest difference between a typical TV and a monitor is how it does or does not filter the input and its ability to display high resolution color information. Video is setup to compress the color (chroma) resolution to conserve valuable broadcast spectrum and storage media while maintaining the black and white (luma) resolution to keep the picture sharp. Most televisions assume that color compression has occurred and they do not display much more than one half the resolution of the black and white signal. This works perfectly well with video sources like DVD players, cable or satellite boxes, but it comes up short when trying to display an image from a computer which has no chroma compression.

Table 1 illustrates the limiting resolution of the 6501mB on each of its high quality video inputs. The highest resolution pattern that was obvious from my AccuPel HDG-3000 signal generator is what was chosen. 1 pixel resolution is the best rating in this table. This generator does not have fractional pixel resolution so a limit of two pixels means that one pixel was not obvious on that input, but two was. It is very possible a one and a half pixel burst would be visible, but that type of resolution is unavailable on this device. Two pixels of chroma resolution will not result in any loss of information for video sources. The limiting resolution listed may be filtered to some extent at that point. The input and resolution with the fewest problems is labeled as best in this table.

The real world performance difference between the DVI, VGA and component inputs on this television are relatively small. A 480i input to component inputs #4 and #5 did have significant noise on the one pixel pattern. I would avoid those inputs for this resolution if possible. 720p on the VGA and DVI were a tie for best. Filtering is tunable on all inputs except for 720p which is handled properly and has no filtering.

More Specs.:

Audio Inputs/Outputs

- Each video input has a L/R stereo RCA audio input
- One L/R RCA audio output
- One subwoofer RCA output
- Audio outputs can be fixed, variable or off

Audio

- 15 Watt/Channel Stereo Amplifier
- Virtual Dolby® Surround Technology
- Two 5.5 inch woofers and two 1 inch tweeters
- Speakers are configurable as center channel
- Internal speakers can be switched off

Lamp

- 150 W Metal Halide
- 4000-6000 hour life
- User replaceable

Resolution \ Input	DVI	VGA	Component #4 & #5
480i Luma	1 Pixel	1 Pixel	1 Pixel (noisy)
480i Chroma	1 Pixel	1 Pixel	2 Pixel (noisy)
480p Luma	1 Pixel	1 Pixel	1 Pixel
480p Chroma	1 Pixel	1 Pixel	1 Pixel
720p Luma	1 Pixel (Best)	1 Pixel (Best)	1 Pixel
720p Chroma	1 Pixel (Best)	1 Pixel (Best)	1 Pixel
1080i Luma	2 Pixel	2 Pixel	2 Pixel
1080i Chroma	2 Pixel	2 Pixel	2 Pixel

Table 1 - High Resolution Input Resolving Power With AccuPel HDG-3000

Table 2 shows the resolution of the standard definition inputs. Test patterns used for these inputs were different than Table 1. A score of 6.75 MHz on the luma channel is the best that can be achieved and a score of 3.38 MHz is the highest on chroma. The quality of most of the inputs was very good for its type with component being the best as expected. The composite input was particularly noisy on the color pattern and should be avoided if possible. This could be a problem in particular for people with Laserdisc players or VCR's.

Resolution \ Input	RF-Video	Composite	S-Video	480i Component
480i Luma	4.25 MHz	6.75 MHz	6.75 MHz	6.75 MHz
480i Chroma	2.0 MHz (noisy)	2.0 MHz (noisy)	2.25 MHz	3.38 MHz

Table 2 - Low Resolution Inputs Resolving Power Avia Pro

More Specs.:

Control Options

- Handheld remote
- Programmable remote codes for on or off and input selection
- RS-232 input for automated display control

Video Processing

The television must do some processing to all inputs. The 6501mB includes deinterlacing to convert interlaced signals when necessary to progressive to match the LCoS panels used. The ability to convert a signal that was originally film from video into its individual film frames (inverse telecine) is also included. A scaler circuit is available to resize an image to fit the screen when the image is 1280 x 720 pixels. The performance of these processes can dramatically reduce the image quality.

Filtering is available on all inputs types that do not match the 720p resolution of the television. This is required to avoid artifacts from sampling the image improperly. A good example of this type of problem that many people have seen are the wagon wheels that appear to go backwards on the old Western's. The wheels look to be spinning backwards because they are sampled too slowly by the film. When repetitive fine lines in an image are not sampled frequently enough a false set of line pairs may appear. To avoid this problem filtering is used so the image being displayed has a lower resolution that is a better match for the sampling period of the display which in this case is 1280 horizontal lines and 720 vertical lines. Unlike other products on the market, the user menu allows you to choose the amount of filtering. You can choose between soft, normal, sharp and sharpest in the menu. Soft appears to be a little softer than necessary to eliminate sampling problems and sharpest appears to eliminate most of the filtering if not all of it. Normal is what I used to properly filter the input and avoid sampling problems while some may prefer sharpest to have a sharper image and live with sampling artifacts now and then.

Scaler performance in this television appears to be exceptionally good. I saw no problems with images that were related to the scaler. Images were generally smooth and sharp when scaling was involved, but I would expect nothing less at this price point.

Table 3 summarizes the deinterlacer and inverse telecine performance. In general 480i (normal TV) is better handled by the lower resolution inputs. This is caused by the television using a different processor for those inputs in an attempt to make regular TV more enjoyable. The only problem with this is it can be pretty complex

Test/Input	Composite/S-Video/ Component #1 (Film Auto)	Composite/S-Video/ Component #1 (Film Off)	Component #4/5
Jaggies #1	10 Degrees	10 Degrees	20 Degrees
Jaggies #2	Good	Good	Fair
Film Detail	Pass	Fail	Pass
3-2 24 fps Film	Pass	Fail	Pass
Mixed 3-2 with Titles	Fail	Pass	Pass

Table 3 - 480i Input Deinterlacer Performance With The HQV 1.4 Benchmark Test Disc

to setup a system that uses the inputs in an optimal manner. With Input #1 for 480i component and DVI, VGA or HDTV component for 480p, 720p or 1080i. This situation where certain inputs are better than others in some complex pattern though is much more common than is popularly known and is no reason to avoid this TV.

I saw no problems with any input causing a misalignment of color and black and white information (chroma delay). This can occur when attention is not paid to how signals are handled inside the television causing timing errors that make the color and black and white information not overlay on top of one another properly.

Chroma compression artifacts (chroma bug or CUE) were absent that can be caused by 480i input processing. This manifests itself as a combing artifact on images with bright colors at boundaries with other colors.

No signs of the audio or video being out of synchronization were present in any of the tests I ran over the component and DVI inputs. This is a common problem and it can be difficult to determine if it is the broadcast of the TV. I found no indication that this television contributes to the problem.

Surprisingly this TV supports the PAL standard on several inputs. The HDTV Component inputs accept PAL progressive and looked fabulous compared to the PAL to NTSC conversion built in my player. S-Video also does a very nice job with an interlaced PAL signal. This is an uncommon feature to find in a rear projection TV in the USA and one that I greatly appreciate. The composite input also accepts PAL, but the quality is exceptionally poor and is nearly unwatchable. It is likely the VGA and DVI input can accept PAL progressive as well, but I have no sources for those input types to verify it. This feature can be very useful for people who like foreign movies that are not available in NTSC format or for people that need a TV that they can take overseas.

1080i must also be deinterlaced and scaled by the 6501mB. Based on the limited test material I have available the performance is very good with 1080i material. I have seen some flickering on test material, but 1080i broadcasts or D-Theater movies look excellent with 1080i material with very few signs of problems converting the interlaced material to progressive.

The color decoder in this television is very accurate and the adjustments in the user menu are not too coarse. You can also turn on only the red, green or blue colors in the user menu to accurately check the performance. There is no provision for adjusting the color decoder other than the color and hue adjustments in the user menu.

I prefer the video processing in the 6501mB over the Qualia 006 in every situation except for composite video.

Color Reproduction

Reproducing color accurately is key to having high quality film or video reproduction. How a television matches the desired color of gray across various light output levels is one of the key indications of its ability to reproduce color. Other important factors are how close are the red, green and blue primaries to their desired colors along with their secondaries.

Table 4 shows the calibration results of gray at various levels after calibration. The target value is D65 which is a point in color space. Color temperature is commonly used to indicate color error, but Delta E is much more useful. An error of one in Delta E is barely perceptible. The grays on this television looked very good in general. The television tracked gray scale very well except at very low levels where the instruments won't read accurately. The final calibration was shifted off of the D65 target for the higher light levels to dramatically improve the low level blacks. Without this the low level blacks would have strongly shifted to green or purple which is highly undesirable. This is a very common problem with many display types and I have observed it with both the Qualia 006 and JVC D-ILA. However, the Qualia 006 does do a better job tracking black at very low light levels after calibration.

The gamma shown in the table is the nonlinear relationship between signal input level and light output. The target value is to be between 2.2 and 2.5 with 2.2 being the typical goal. The measured gamma fell a little short of expectations. This results in the image having a little less contrast or punch than desired. This could have been improved by altering the gamma curve provided.

Input Level	Color Temperature	Delta E	Gamma
20%	6609 K	2	1.8
30%	6671 K	4	1.9
40%	6704 K	4	2.1
50%	6736 K	6	2.0
60%	6747 K	5	2.1
70%	6716 K	5	2.1
80%	6698 K	4	2.2
90%	6762 K	4	2.2
100%	6634 K	2	-

Table 4 - Post Calibration Gray Scale Accuracy

Input Level	Color Temperature	Delta E	Gamma
20%	7282 K	14	1.8
30%	7332 K	15	1.9
40%	7280 K	15	2.1
50%	7416 K	16	2.0
60%	7423 K	15	2.1
70%	7336 K	15	2.1
80%	7404 K	15	2.2
90%	7391 K	14	2.2
100%	13212 K	58	-

Table 5 - Pre Calibration Gray Scale Accuracy

Table 5 shows the pre calibration results. The color error without calibration was pretty severe. This is typical for most display devices on the market. The very strong shift of color at 100% light output is common for a fixed pixel device that is being driven beyond its linearity limit.

Chart 1 on the next page shows the color accuracy of the 6501mB versus the HDTV color gamut. The color of blue is very close to the standard while red and green are somewhat more saturated. After several weeks of viewing I found the colors of this television to be very engaging and one of its stronger points. While not entirely accurate the extra color saturation along with the excellent blacks contributed to a very satisfying experience.

Color uniformity is a problem with LCoS and LCD. The Brillian had difficulty with color shifting on images horizontally that were close to D65. This was a little worse than the Qualia 006's I have seen, but was subtle enough that it was not usually visible outside of test patterns.

Optical Performance

All projection based displays contain multiple optical components that must perform well to avoid image artifacts and aberrations. The optics in this unit performed at

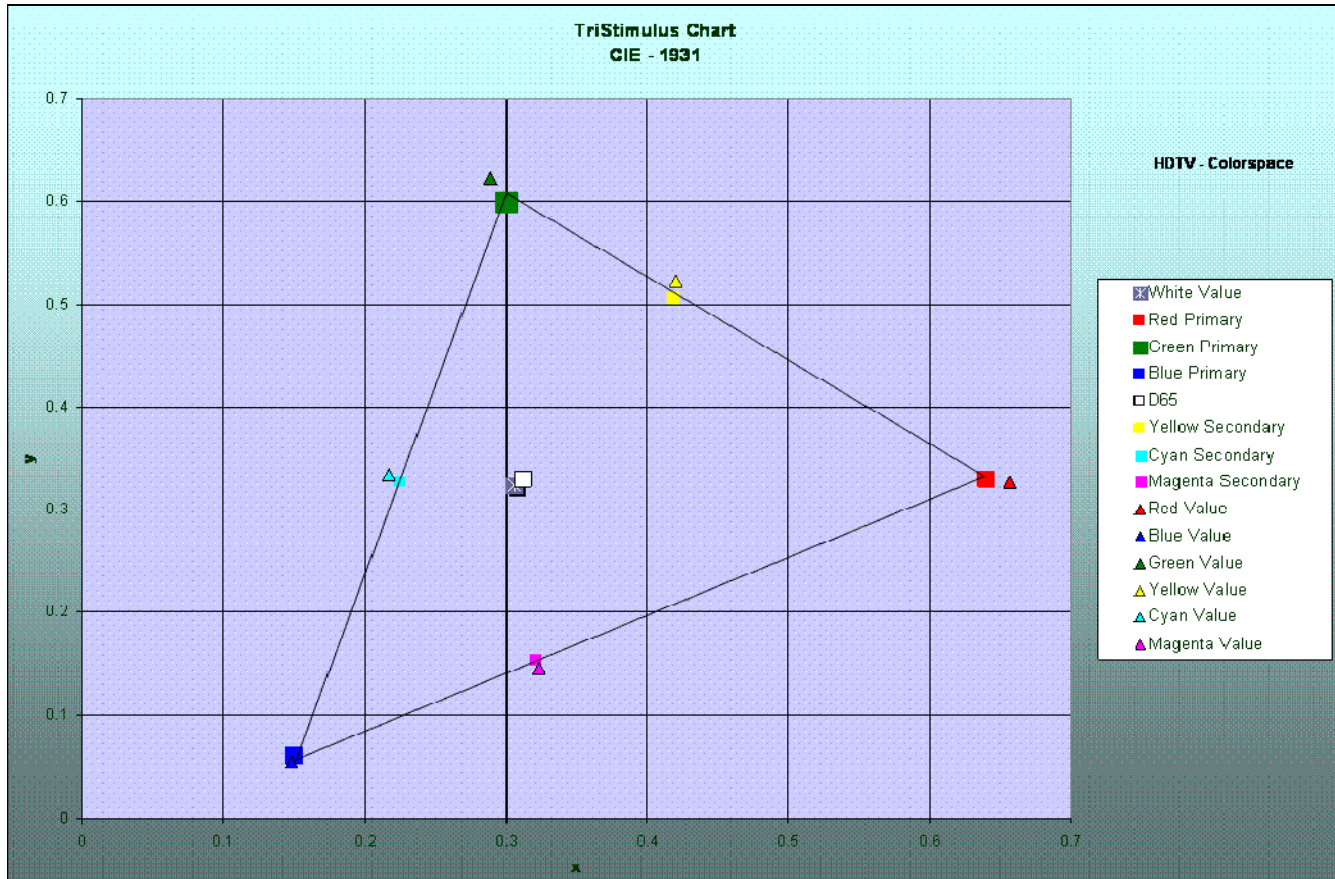


Chart 1 - 6501mB Color Accuracy

an acceptable level, but it is one area that could see improvement. Color smearing (chromatic aberration) was seen almost as soon as the image was off of center. White lines were most effected by this and were smeared by up to one pixel at the far corners from this effect. This is one area where this set falls short of the Qualia 006 which has less than one pixel of chromatic aberration.

Overscan is the portion of the image that is not visible from optical restrictions and electronic processing. This set has very minimal overscan with only about 1%. This is a great match for use as a computer monitor because very little of the Windows task bar is cut off.

There was also an imperfection in the screen or mirror assembly that could be seen as a fixed aberration on various bright images when the color was consistent over a large part of the screen. I found this to be much more distracting than the chromatic aberration which I usually could not see from 10 feet away. Luckily the scenes where this could be seen were few and far between. There was no indication of internal reflections from any of these components which can be a real problem.

Another key part of optical performance on rear projection televisions is the anti-reflection coating on the screen. This can make the set more useable with windows in close proximity. I really liked the coating used on this set and can highly recommend it for poor situations like my living room.

The screen appeared illuminated considering it is very high gain. The light output fell off about 50 percent in the corners versus the center. This is more than I would like, but it was very not very noticeable and is common for many projection based displays.

Light Output and Dynamic Range

A satisfying image should also be bright and dark as needed. The LCoS panels were very capable of putting out ample amounts of light. I measured a maximum light output of 75 foot Lamberts after calibration. This was plenty bright enough for my living room which lacks sufficient light control during the day. Black is also dim enough to be pleasing in totally dark room with most viewing material. The blacks are not what I would call inky, but they will satisfy most people. I measured an on/off contrast ratio of 935:1 and an ANSI contrast ratio of 67:1 after calibration. Near black performance did shift color more than I would have liked.

I would have liked to have seen a variable wattage lamp and/or iris mechanism that dropped the maximum light output to around 25 to 30 foot Lamberts. This would have made the blacks look blacker in low light situations and improved the contrast ratio in those situations as well. This is an area where the Qualia 006 is superior to the 6501mB.

Audio Performance

Audio is respectable for a rear projection television, but not outstanding. Two Vifa 5.5 inch woofers (TC14WG49) and two Vifa 1 inch tweeters (D25AG-05-06) do the duty. Don't expect earth shattering base from this system, but it does deliver a pleasing level of sound quality. High frequencies were cutoff at about 15 kHz which was disappointing. A subwoofer output is provided that can be used with an external subwoofer to extend the base response.

Interestingly, the 6501mB can serve as the center channel of your home theater audio system as well. This is accomplished in the user menu by locking the audio to Input #5. I found the internal speakers to be too widely spaced to focus the image to my satisfaction. However, my speakers and processor integrated the low frequency response well with my system. 15 watts per channel was about 15 watts short of what I would have liked to have had to make this work at a more acceptable volume level, but I was comparing it to a system with over ten times that power available and a center channel that was designed only for that purpose.



Fan noise with this television produces a sound level that I found very objectionable in low volume scenes. I measured 60 dB at the back of the television which is about 8 dB louder than my Sony KF-50XBR800. The level of annoyance is much greater though than the 8 dB would imply. I am guessing this is because the frequency of the Sony's noise is much lower than the Brilliant, but I am not certain of that because my spectral analyzer is not accurate at these levels.

Video Artifacts

Displays are subject to producing many different imperfections on images that are not present in the original image. Except for what has been mentioned previously the 6501mB is remarkably free of artifacts. When the image that enters the television is free of problems the image then produced is remarkably smooth and clear. I have not seen another rear projection television that does such a good job of presenting an exceptionally clean image. This is one area where I find the Qualia 006 to come up a little short in comparison.

Finding source material for this display that does not show all of its flaws with this exceptionally revealing product is difficult. An alternative to only watching HDTV is using an Algorith Mosquito as a companion product to help smooth out those MPEG artifacts that become all too obvious on this display. After having both of these in action for a while I can highly recommend the combination.

One problem evident with this display was its sensitivity to electrical noise. I could see subtle wave patterns when highly saturated images of the same color covered a fairly large portion of the screen and various high large appliances were operating in my house. A very high quality power filter is probably warranted for this display.

Miscellaneous Items

During the course of this review I found several other things that I found objectionable about how signals were handled, but one of the unique features of this set allowed Brilliant to fix them before I completed this review. This feature is a firmware upgrade system that is built into the television. It is not something that the average consumer will be able to use without help, but a technician or calibrator with proper knowledge and equipment can easily upgrade the television software. I have the impression that Brilliant is committed to getting the best performance from their products which is likely to yield improvements beyond what I am reporting here as they perfect their system.

I am used to rear projection sets with lamp based technologies not leaking significant quantities of light. Unfortunately, the 6501mB does leak light from the back on the right side. Viewers that sit past the right edge of the set will see this unless the set is in some type of enclosure.

The front panel controls on this television are positioned very well. High quality switches are used that backlight when depressed. Your typical plastic remote is included, but I would assume most people are going to use a programmable remote and put this one in the drawer.

Ratings Summary (With 5 Being Best)

Please realize that I am being very picky here. This set is generally gorgeous in use. However, no display is perfect and hence the need for discussing its shortfalls so you can decide if this display is for you.

Color Performance (4.5) - Colors on this set were generally exceptional. Its less than stellar gray scale tracking at low light levels (less than 10% input signal) is a negative along with the uneven gray scale across the screen when an image is close to neutral in color.

Bright Image Performance (5) - 75 foot Lamberts should be bright enough for almost all home theater applications and I certainly would not want more.

Dark Image Performance (4) - Dark scenes on this television are generally very pleasing. However, the color shifts at low light levels are a problem and the minimum light output (black) is not quite as dark as I would like to see for a totally dark room.

Image Artifact Performance (4) - The presence of an anomaly in the screen or mirror assembly that was visible on some bright scenes was an artifact that I found distracting, because I kept noticing it. Without that this display was amazingly free of artifacts except those caused by the source and electrical noise.

Image Details (4) - Most of the inputs on this TV are spectacular in their ability to resolve details except for composite which is too noisy. This set deserves a 5 if you ignore composite and the upcoming 1080p sets, but I can't bring myself to do that.

User Features (5) - It is hard to find any fault with the user features of this product and anytime I did Brillian sent me a firmware update that I loaded into the television with them included. This thing will even automatically will adjust itself with the push of a button to match the VGA output from your computer if it can.

Connectivity (4) - With DVI, VGA, Component, S-Video, Composite and RF video inputs I would be satisfied with the connectivity this set provides, but the number of connections falls a little short of some peoples expectations. I would also liked to have seen an ATSC tuner, and an IEEE-1394 connection or two for D-VHS and whatever HD disc format is coming.



Equipment Associated With Review:

Test:

- HDTV Generator: AccuPel HDG-3000
- SD Generator: Compuvideo PocketGen-5
- Color Analyzer: Ovation Multimedia™ OpticOne™
- Spectroradiometer: GretagMacbeth Pro
- Light Meter: Sekonic L-558C
- Real Time Analyzer: TrueRTA™ /w Behringer ECM 80000
- SPL Meter: RadioShack® Analog SPL Meter
- DVD's: Avia Pro™, Digital Video Essentials, HQV Benchmark
- D-Theater: Digital Video Essentials 1080i & 720p

Video:

- HDTV Tuner: LG LST-3410A
- HDTV Cable: SA-8300HD (Passport Software)
- D-VHS: JVC® HM-DH30000U
- DVD Player: Denon DVD-3800
- Video Processor: Algolith Mosquito

Audio:

- Audio Amplifier: Outlaw Audio 750
- Audio Processor: Krell Showcase Processor
- Front Main Speakers: Hales Revelation III
- Center Channel: Hales Revelation Center
- Side Surrounds: KEF Audio Q15

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