

# Larger colour gamut than ever

**Our second round of monitor testing this year confirms just how intense the development of monitors is at the moment. A whole range of high-gamut LED backlit monitors has hit the market, and several qualify for high-end softproofing when tested.**

Among the newcomers are the HP Dreamcolor series, bundled with calibration software and hardware (a HP-branded version of the X-Rite Display 2 spectrophotometer). The U-DACT (Ugra Display Analysis and Certification Test) verification software is beginning to be recognised in the market, and both LaCie and Quato now include it in their software.

But a large colour gamut and high contrast ratio is not the only criteria for a high-end softproofing monitor. Accurate calibration, uniform colour reproduction across the monitor surface and stable colours independent of viewing angle are other important criteria. Not all of the monitors suggested by vendors as suitable for use in colour critical applications meet all of those demands.

## Evolving technologies

It's only a few years ago that LCD monitors were introduced to the market, and in the beginning they were not considered suitable for high-end graphic arts production, mainly because of poor performance in regard to the angle at which the image could be viewed. Another problem was that the existing range of measuring devices wasn't always capable of correctly calibrating LCD monitors, and there are still some considerations to be made when choosing the best calibrator – both software and hardware – to calibrate and verify the monitor.

A hasty conclusion would be to prefer spectrophotometers to colorimeters, but some of the older spectrophotometers may yield a worse result than when using a colorimeter designed for that particular type of monitor. One of the most popular measuring devices is the X-Rite EyeOne Display 2, bundled with monitors from the likes of HP, LaCie and Samsung. Quato, on the other hand, still prefers the older X-Rite DTP94 (at some point sold as Monaco Optix Pro) since it has found it to be more accurate and X-Rite continues to manufacture new ones for it.

The new monitors in general use LED as the backlit light source to achieve larger colour gamut and higher contrast, and also to reach higher luminance levels. But this technology is implemented in several different ways, and one of the challenges is to control the temperature in the monitor, and compensate for non-uniformity.

Another challenge is to offer stable and accurate colour regardless of viewing angle. Here, the monitors with IPS (In-Plane Switching) panel ►

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▼ technology in general perform better than monitors with VA technology (Vertical Alignment, either MVA or PVA). But both technologies perform much better than the old TN (Twisted Nematic) technology. And all of these panel technologies continue to be improved. We are most certainly about to see even better performance regarding view angle stability in the near future.

## What to look for in a monitor

There are four major requirements for a monitor to be suitable for high-end softproofing. First of all, it should be possible to perform hardware calibration. This does not only mean that you use a measuring device, but that the calibration software actually can control the monitor directly, not only the graphics card. The control can be through a DVI-cable, or through a separate USB-cable. The way that the DVI interface is used for calibration is not entirely standardised, neither on Mac OS nor on Windows, so it may or may not work to satisfaction depending on which graphics card you have in your computer.

Using a separate USB-cable connected to the monitor makes for faster calibration, and sometimes a more reliable one too. The calibration should use more than eight bits per colour channel in this important phase, preferably 16-bit handling of the input data, and at least 10-bit data in the resulting output to the monitor. The principle is the same as when dealing with high-end scanners and digital cameras – in order to provide correct final 8-bit colour data (typically sRGB, Adobe RGB or separated CMYK image files), the signal processing should be 10-bit or higher per channel.

Secondly the monitor should be fitted with a hood to minimize the influence of ambient light (a serious high-end monitor vendor should provide this option).

Thirdly, the calibration software should offer a means of verifying the calibration, including testing the final ICC-profile that is generated. This should include the possibility to evaluate if a monitor conforms to the ISO 12646 softproofing standard, as far as it can be evaluated with standard spectrophotometers and colorimeters. One stand-alone software for this is the U-DACT (Ugra Display Analysis and Certification Tool), but GCS offers the ORIS Certified Monitor software which can do the same thing in a similar way. The Color Solution software basICColor also includes functions to verify the monitor. In a quality managed production environment it's important to be able to verify the colour critical devices, and a monitor used for softproofing is definitely among those devices.

Last but not least, it's very important that a high-end softproofing monitor is very insensitive as to what viewing angle you look at the screen. There shouldn't be a large hue shift in the picture just because you move your head somewhat.



*The HP DreamColor series is marketed to produce "billions of colours" since it uses 10-bit per channels signal processing. In reality the human perception can't detect more than around 3 million different colours (tone values), but it is of importance that the signal processing is done with at least 10-bit colour depth per channel.*



*The LaCie 700-series use LED as the backlit light source, so reach a high colour gamut. The LaCie 724 passes the new and stricter U-DACT verification test.*

## ▼ The tested monitors

In the previous round we tested monitors from Apple, Eizo, LaCie, NEC and Samsung, and for this issue we've followed up with monitors from HP, Quato and ViewSonic, and including some new models from LaCie and Samsung.

Hewlett Packard is the newcomer in this category with the Dreamcolor series, and we tested the LP2480zx, a 24ins LED backlit LCD with an IPS technology panel from LG. It's obvious that this monitor is mainly aimed at video and 3D animation editing, since there are no presets in the software for dedicated graphic arts production. Presets like Rec. 601 and Rec. 709 are video- and HD TV-settings, and reveal the cooperation HP has had with DreamWorks Animation in designing this monitor. We failed to make the monitor pass verification tests for some parts of the ISO 12646 standard, even though we not only used the U-DACT software but also the ORIS 'Certified Monitor' software and checked uniformity using the BabelColor software. The accuracy of the white point wasn't precise enough, and the non-uniformity was another problem.

It didn't help matters that the HP version of the measuring device wasn't recognized as a normal X-Rite EyeOne Display 2, and the HP calibration software didn't accept any other device for calibration. We recommend HP to open up the calibration software to the most common calibrators on the market, and provide UGRA with information about its hardware so that it can be recognised by the U-DACT software. The non-uniformity is perhaps more difficult to tackle, but other vendors use technology to adjust the panels in hardware, to obtain better uniformity over the surface. Despite this, the monitor has the potential to join the exclusive group of high-end soft proofing monitors with some modifications and improvements to software and hardware.

LaCie has introduced the 700-series of LED backlit LCDs, and we tested the 724 model. The calibration software performs hardware calibration and a new feature is the included U-DACT verification of ISO 12646 compliance. The calibration software 'Blue Eye Pro PE' (where PE stands for Proofing Edition) accepts most of the measuring devices on the market, rather than just the LaCie version of the X-Rite EyeOne Display 2. LaCie, like Eizo, use Samsung panels with S-PVA technology, so the monitor is slightly sensitive to view angle. But the LaCie 724 monitor passed the U-DACT test, and we congratulate LaCie on having made a good choice in deciding to include this verification tool in the software, and to open up the software for measuring devices other than its own.

Quato have worked hard to find ways to control temperature and stabilise backlit panels to obtain good uniformity over the whole surface. The new IP 262e monitor uses a luminance and whitepoint stabilizer to keep the monitor within tolerances over time and compensate for temperature changes. Quato use an S-IPS panel, so it has a low viewing angle dependency. Quato was the first to include the U-DACT verification tool in its calibration software, and the software accepts most of the common ▶



*Samsung SyncMaster XL30 (below) and XL24 (above) are the latest two monitors in the XL-series. They both pass the older, more generous U-DACT test, but not the stricter version 1.3 of this verification tool.*



measuring devices on the market. Quato provides its own version of the X-Rite DTP94, called Silver Haze Pro, since it has found this to work best on LCD monitors, and to have high enough accuracy. Quato may be the lesser-known vendor on the market, but it offers dedicated softproofing monitors for demanding colour critical work.

Samsung debuted its LED backlit technology with the XL20 20ins model, tested in our previous round. This time we looked at and tested the larger models XL24 and XL30. The S-PVA panel technology has a slight tendency for view angle dependency, but is much improved over the old PVA technology. While the monitors pass the older U-DACT version 1.2 test, the stricter tolerance levels of U-DACT version 1.3 tripped up the XL24 and XL30. The white point and grey balance calibration doesn't seem to be accurate enough, although the colour gamut is large enough for high-end softproofing. If Samsung can improve the software to obtain better uniformity and accuracy, these monitors might pass the ISO 12646 aligned verification test in the stricter U-DACT 1.3.

ViewSonic is the underdog in this test, but brought in because we wanted to check out how its VLED 221wm LED backlit monitor would compare to much higher priced competitors. ViewSonic promotes its OptiColor technology, as 'ideal for graphics production', so it would seem to offer a wide gamut monitor for soft proofing at low price here. But when tested against our four main criteria, listed above, the ViewSonic monitor comes up short in all of them. ViewSonic doesn't offer hardware calibration, doesn't provide dedicated software for calibration and profiling, and so doesn't offer any means to verify the calibration.

While it might be possible to calibrate the monitor by third party software (and we have tried several, including ORIS Certified Monitor as well as Color Solution basicColor Display and others) the view angle sensitivity is too high for the monitor to be suitable for high-end colour critical softproofing. ViewSonic Europe has wisely tuned down the marketing rather than pushing the monitor as suitable for high-end graphic arts production, but in other markets around the world ViewSonic still woos the graphic arts. But this is not to say that the VLED221wm is a bad monitor – it's a surprisingly low priced LED backlit monitor with rich colours and good performance for other types of applications other than colour critical softproofing.

## How the test was made

We tested three of the four main criteria using the UGRA analysis tool U-DACT, while view angle sensitivity was tested through visual evaluation. The colour gamut is calculated using the Chromix ColorThink Pro software, where the total number of colours is extracted from the ICC profile. The calculation is based on the fact that the human eye can't register colours with a smaller colour difference than that of  $1 \Delta E$ . While we in theory should get more than 16 million colours in a 24-bit RGB image (and billions with 12, 14 or 16-bit signal processing per channel), in reality the human perception can only register around 2.5-3 million ▶



*Quato has launched a new backlit monitor on the market, the IP262e, which combines large colour gamut with very accurate colour and uniformity over the whole screen.*



*ViewSonic offers a very low priced LED backlit monitor with the ViewSonic VLED221wm. But it's very sensitive to view angle, and doesn't pass the U-DACT verification tool for high-end softproofing according to ISO 12646.*

colours. The monitors in this test all reach a larger colour gamut than Adobe RGB (for the total volume), and typically reach around 1.4 million colours. This gives them headroom to also include the printable colour gamut of ISO 12647-2 on glossy paper, among the largest colour gamuts for CMYK-based offset printing.

## The results in numbers

Since the previous test early this year the U-DACT software has raised the tolerance level for ISO 12646 aligned compliance. To be able to compare this new test to the previous one we needed to test both with the older version 1.2 and the new, stricter, version 1.3. In the next round we will only use version 1.3, since the old version of U-DACT was too generous, and allowed monitors with a visual non-uniformity and poor tone gradation to pass the test. Among the monitors we plan for the next test are the forthcoming Apple Cinema Displays equipped with LED backlit technology.



*By far the most popular measuring device for vendors to bundle with a high-end proofing monitor is the X-Rite Display 2 colorimeter.*

Fig 1

Test results; Colour gamut and view angle			
Model	Total Colours	% of Adobe RGB	View angle (1-5)
Adobe RGB 1998	1,306,820	100	
HP Dreamcolor LP2480zx	1,436,000	110	4.5
La Cie 724	1,441,000	110	4
Samsung SyncMaster XL24	1,379,000	106	4
Samsung SyncMaster XL30	1,355,000	104	4
Quato IP262e	1,363,000	104	4.5
ViewSonic VLED221wm	1,277,000	98	2.5

The uniformity over the surface is important, and should be adjusted both over time and because of changes in temperature. The LED backlit LCDs present new challenges here, even if they offer a large colour gamut.

Fig 2

U-DACT test of softproofing capacity				
Model	Multi Colour proofing	U-DACT 1.2	U-DACT 1.3	Uniformity
HP Dreamcolor LP2480zx	yes	yes	no	medium
La Cie 724	yes	yes	yes	good
Samsung SyncMaster XL24	yes	yes	no	medium
Samsung SyncMaster XL30	yes	yes	no	medium
Quato IP262e	yes	yes	yes	high
ViewSonic VLED221wm	yes	yes	no	medium



Fig 3

Specifications and approx. price			
Model	Screen size (inch)	Resolution	Price EU (approx)*
HP Dreamcolor LP2480zx	24	1920x1200	2,300
La Cie 724	24	1920x1200	1,600
Samsung SyncMaster XL24	24	1920x1200	1,400
Samsung SyncMaster XL30	30	2560x1600	3,000
Quato IP262e	26	1920x1200	2,700
ViewSonic VLED221wm	22	1680x1050	350
*VAT excluded			

We now have a range of wide gamut monitors on the market, and one would think that most of them would be suitable for high-end softproofing. But it's important to realise that in order to achieve an accurate result the monitor needs to be hardware calibrated, and to have very uniform colours over the whole panel. And it should be very insensitive to the view angle of the operator relative to the screen. As we have found in this test, several vendors still need to improve the performance on this.

– **Paul Lindström**

