



# Dell U2412M

Simon Baker, 24 August 2011

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Above: Dell U2412M



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## Introduction

We've been bringing you news about the new U2412M monitor since we [first announced](#) in May that Dell would be releasing a new range of screens in their very popular UltraSharp range. By way of a short history lesson, we first were informed that the new Dell monitors would be in sizes of 21.5, 23 and 24" and that all of them would in fact be 16:9 aspect ratio. They would all offer a 1920 x 1080 resolution with an 'H' in the product name (e.g. U2412HM at the time) denoting this format. The 'M' in the product name would signify the use of an e-IPS panel; thankfully a welcome retention of IPS technology in these models. We were ready for the arrival therefore of the U2212HM, U2312HM and U2412HM as they were at the time.

Later on in July, we found out that in fact the 24" model would be a 16:10 aspect ratio model, much to the delight of many readers who had moaned about the move away from the 1920 x 1200 resolution of the earlier Dell models including the U2410. The 21.5" and 23" models would remain 16:9 aspect with 1920 x 1080 resolutions. Soon after, a few official images of the screen [began to leak on Dell.com](#) and on 11th July we brought you some [exclusive information](#) about the U2412M including photos, specs and panel information. On 21st July the U2412M [went live on Dell.com](#) officially and the screen was available to pre-order in many countries.

Now the U2412M is finally here and available Globally. We have the screen with us for our usual thorough testing. Of interest are the use of an e-IPS panel combined with LED backlighting (W-LED) and an updated design and high reported dynamic contrast ratio. We will of course make some direct comparisons with the U2410 model as well and compare features and performance so you can make an informed decision. We should say at this point that the U2412M is not replacing the U2410, which will still be available as a slightly higher end model as there are some significant differences between the two screens.

The U2412M is marketed on their website with the following summary description which plays on the key selling points of the screen well: "Enjoy widescreen performance, any way you want it. With a 24" 16:10 panel, IPS technology and LED backlight, the U2412M provides a brilliant view, plus amazing adjustability to suit any style."



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## Specifications and Features

The following table gives detailed information about the specs of the screen:

Monitor Specifications			
Size	24"WS (60.96 cm)	Colour Depth	16.7m (6-bit + A-FRC)
Aspect Ratio	16:10	Colour Gamut	Standard gamut = 71% NTSC, 74.3% Adobe RGB, 95.8% sRGB
Resolution	1920 x 1200	Panel Coating	Anti-glare 3H (matte)
Pixel Pitch	0.2700 mm	Interfaces	1x DVI-D (HDCP), 1x D-sub, 1x DisplayPort
Response Time	8ms G2G	Design colour	Matte black bezel and stand. Silver version also available with silver bezel and black stand
Static Contrast Ratio	1000:1	Ergonomics	-21° / +4° Tilt, swivel, 115mm height, pivot
Dynamic Contrast Ratio	2,000,000:1	Special Features	4x USB 2.0 ports
Brightness	300	VESA Compatible	Yes 100mm
Viewing Angles	178/178	Physical Dimensions	(WxHxD with stand) 513.5 x 556.0 x 180.3 mm
Panel Technology	e-IPS	Weight	With Packaging: 7.49kg Without stand: 3.97kg
Backlight Technology	W-LED	Accessories	DVI cable, VGA cable, Power cord, USB cable

The U2412M offers a fairly standard set of PC connections, with a single DVI-D and D-sub available. There is also a DisplayPort interface which is useful since it is becoming increasingly popular with graphics cards and external multimedia devices. Dell have done away with the HDMI interface which is a shame as it is also very widely used. The composite and component connections of the U2410 are also missing, although not missed that much to be honest.

The screen is packaged with cables for VGA and DVI, but a DisplayPort cable could have been useful seeing as the screen offers a DisplayPort connection too. This was included in the U2410 package incidentally.

Dell have included a 4 port USB 2.0 hub which is useful, and something which has been available on the UltraSharp series for a long time. They have done away with the 9-in-1 card reader of the U2410 though which in my opinion is a bit of a shame. A cost cutting measure no doubt. There are no further features here such as ambient light sensors, integrated speakers etc but the screen is compatible with Dell's sound bar.

Below is a summary of the features and connections of the screen:

Feature	Yes / No	Feature	Yes / No
Tilt adjust	✓	DVI	✓
Height adjust	✓	HDMI	✗
Swivel adjust	✓	D-sub	✓
Rotate adjust	✓	DisplayPort	✓
VESA compatible	✓	Component	✗
USB Ports	✓	Composite	✗
Card Reader	✗	Audio connection	✗
Ambient Light Sensor	✗	HDCP Support	✓
Touch Screen	✗	Integrated Speakers	✗

## Design and Ergonomics



Above: front view of the screen. Click for larger version (right)

The U2412M comes in an all black coloured design with matte plastics used for the bezel and stand. The bezel is a thin and attractive at 17mm wide along all sides. The lower bezel features a shiny silver coloured Dell logo. There is no other writing on the bezel at all. The edges of the screen are a little rounded, more so than the rather straight lined U2410 in fact. I personally like the design and it looks very nice on the desk.



Above: Dell logo on front of the screen. Click for larger version



Above: OSD operational buttons and power on/off

The OSD operational buttons and power on/off are located in the bottom right hand corner and are situated on the front of the screen as shown, along the right hand side. These are actual pressable buttons as opposed to being touch-sensitive as they were on the U2410. They are designed in a subtle way so as not to be too obtrusive during normal use and they work very well. When the screen is turned on the power LED glows a very subtle blue colour, and it glows amber in standby.

The panel coating is a standard matte anti-glare (AG) coating. Some users complain about modern IPS panels having an overly aggressive coating. Personally I do not find the coating on this screen to be too bad but it can of course be subjective. The coating seems to be a little lighter than on some of the previous Dell models I think (U2711, U2410), with a slightly less grainy feel. It won't feel the same as some of the glossy or semi-glossy screens of course but it's a little better than some other previous Dell displays.



Above: Rear view of the screen. Click for larger version (right)

The back of the screen is again a matte black plastic and is nicely rounded and enclosed well. The monitor maintains a reasonably thin profile which is attractive. There is a round Dell logo at the top. The interface connections are located in the lower portion which you can see from the above image. While the front of the stand is a matte black colour, the back of the stand is a silver coloured plastic which looks nice.



Above: Rear and front views of the stands cable tidy. Click for larger versions

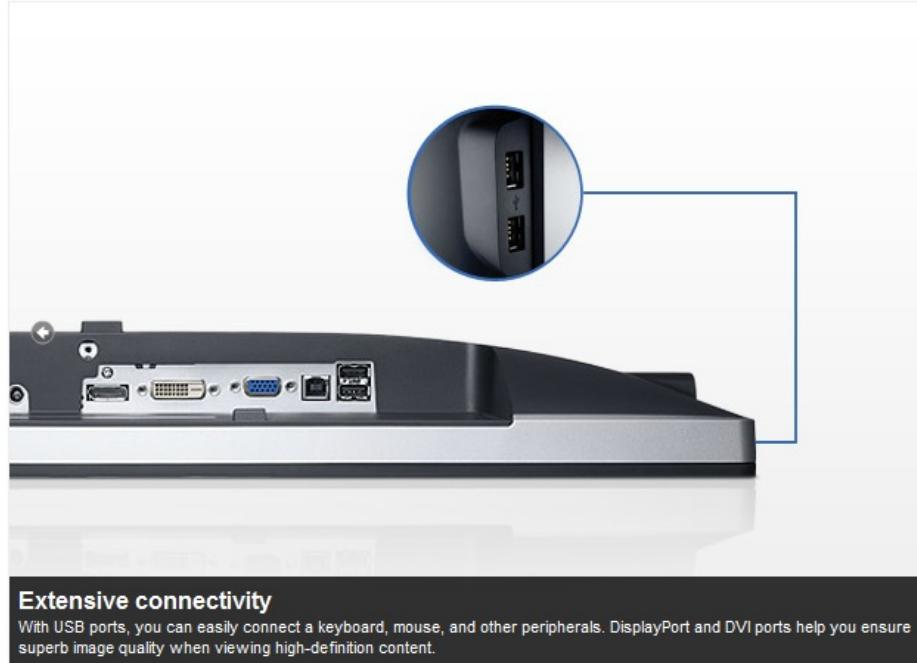
There is a useful cable tidy hole as you can see from the images above.



Above: view of the screen from above.



Above: Underneath of the screen showing interface options as well as power connection and USB.



The back of the screen features video interface connections for DVI, D-sub and DisplayPort. The DVI connection is HDCP certified. There is also a standard kettle lead power connection as the screen has an integrated power supply. This does make it a little thicker than some of the ultra-thin profile screens you can find which offer an external power brick. There is a single connection for Dell's sound bar if you want to add some speakers to the screen. There is also 1x USB upstream for connecting to your PC (cable provided) and 2x USB 2.0 downstream ports available for connecting external devices.



Above: Side USB ports on left hand edge. Click for larger version

A Further 2x USB 2.0 ports are located on the left hand edge of the screen for quick access as shown above.



Above: connection of provided stand. The screen is VESA 100mm compatible

The stand comes packages disconnected from the screen in the box. It is incredibly easy to connection and you simply slot it into the panel and it clips in to place.



If you want, the screen is also VESA 100 x 100mm compliant.



Above: underside view of screen and stand



Above: side views of the screen

From the side the U2412M has a reasonably thin profile and it looks pretty sleek as a result. The left hand edge offers 2x USB 2.0 ports as shown.

A photograph of the Dell U2412M monitor from a side-on perspective. The screen is tilted forward at approximately 21 degrees, indicated by a blue arc and arrow. The base of the monitor is also tilted slightly, indicated by another blue arc and arrow, showing the range of motion for both the screen and the stand.

#### For your viewing pleasure

Designed with your ultimate comfort in mind, the U2412M lets you easily tilt the panel up to 4° forward or 21° backward, or swivel to your preferred angle.

Above: Side view of the screen showing range of tilt adjustments



Above: Side view of the screen showing minimum and maximum tilt range. Click for larger versions

The stand is a plastic design but does offer a decent range of ergonomic adjustments which is pleasing. It is also very sturdy and feels well built. There is no real wobble from the screen and materials feel of a good quality. There is wide tilt range, allowing you to move the screen forward 4° and back by 21°. This affords you a good range for a wide range of angles. The movement is easy and smooth as well.



#### Comfort and style

The U2412M doesn't just look good, but also helps you to maximize your viewing comfort by allowing you to adjust the monitor to your desired height.

Above: front view of the screen showing range of height adjustments



Above: Front view showing maximum and minimum height adjustments. Click for larger versions

The height adjustment range is very good. At the lowest setting the bottom of the lower bezel is approximately 47mm from the desk so you can get a nice low height if you require. The full range of height adjustment is 115mm meaning that at its highest setting the bottom of the bezel sits 162mm from the desk. The movement is again easy and smooth, perhaps a little stiffer than the tilt.



Above: Swivelled view of the screen. Click for larger version

The swivel adjustment is quite stiff and a bit harder to use but the base of the screen stays firm on the desk while the stand swivels from side to side.

**More views**

Need to read newsletters, fliers, web pages without the need to scroll? With the enhanced menu rotation, you can easily rotate the U2412M monitor from landscape to portrait orientation to fit your viewing needs.

Above: Rotated view of the screen



Above: Rotated view of the screen. Click for larger version

The rotation function to switch between landscape and portrait is available but can be a little stiff to use. It's good to see the full range of adjustments available and all are reasonably easy to use, offering a decent range of adjustments and an overall sturdy feel.

A summary of the screens ergonomic adjustments is shown below:

Function	Range	Smoothness	Ease of Use
Tilt	-21° front +4° rear	Smooth	Easy
Height	115mm	Smooth	Easy

Swivel	45° +/-	Quite stiff	Moderate
Rotate	Full	Quite Stiff	Moderate
Overall	Good range of adjustments and mostly easy to use. Sturdy design and feel.		

The screen materials are of a good quality and the design is attractive in my opinion. There is no audible noise from the screen, even if you listen very closely.



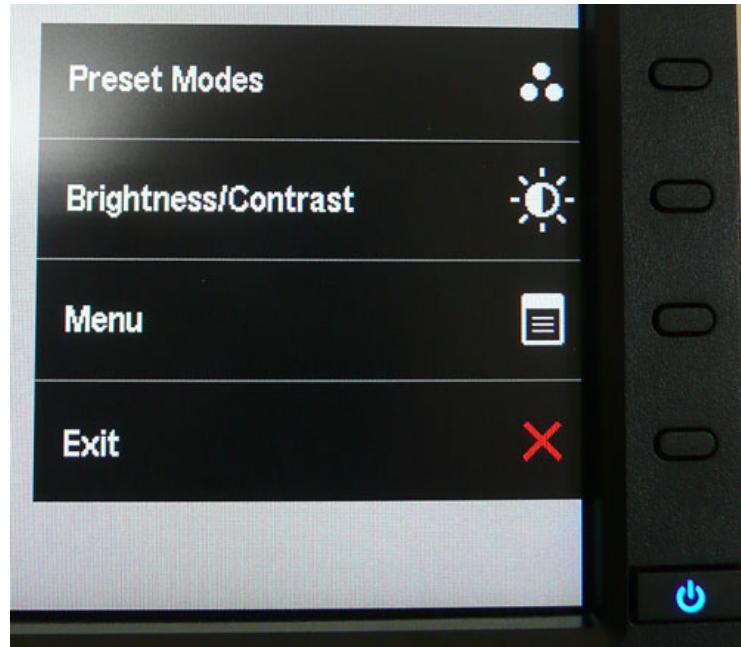
Above: inside view of the panel used in the U2412M.

Removing the back of the U2412M confirms that the screen is using LG.Display's LM240WU8-SLA2 panel which we will discuss a little later on. This is a new IPS + W-LED module which we have not seen used elsewhere yet.



## OSD Menu

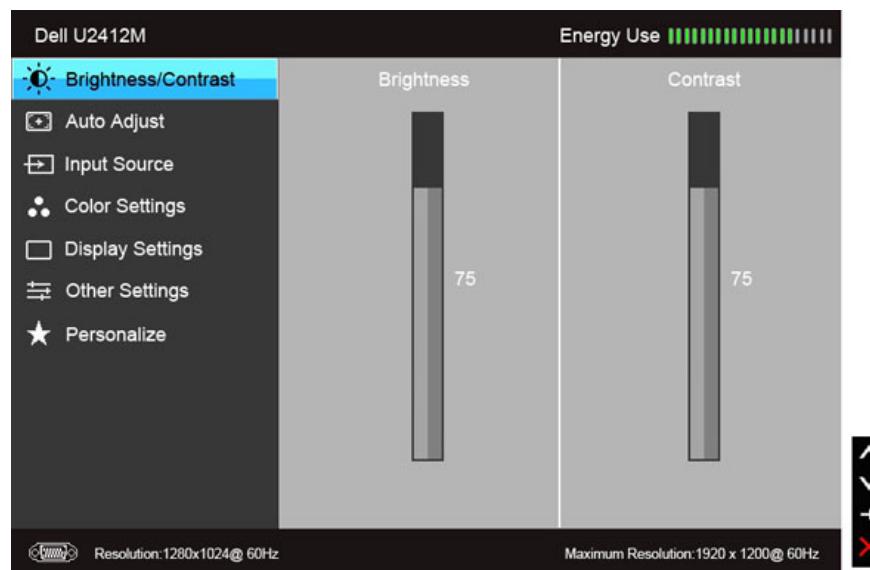
Unlike the U2410, the Dell U2412M has pressable OSD selection buttons instead of any touch sensitive version. These are located on the right hand side of the screen and work well.



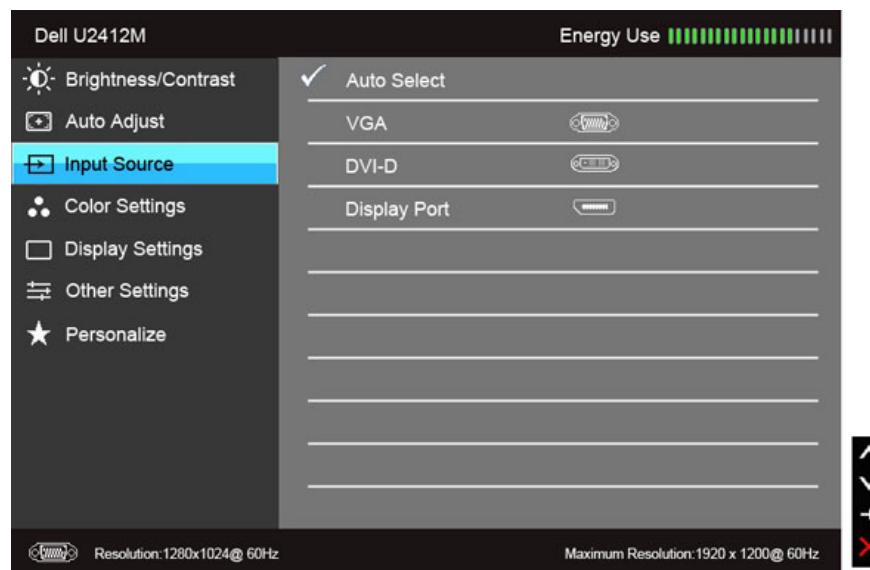
Pressing any of the 4 buttons brings up the quick launch menu, giving you quick access to preset mode selection and brightness / contrast controls. You can also select to enter into the main menu, or simply exit the quick launch menu. You can in fact personalise the two quick launch options from within the main menu should you wish to.



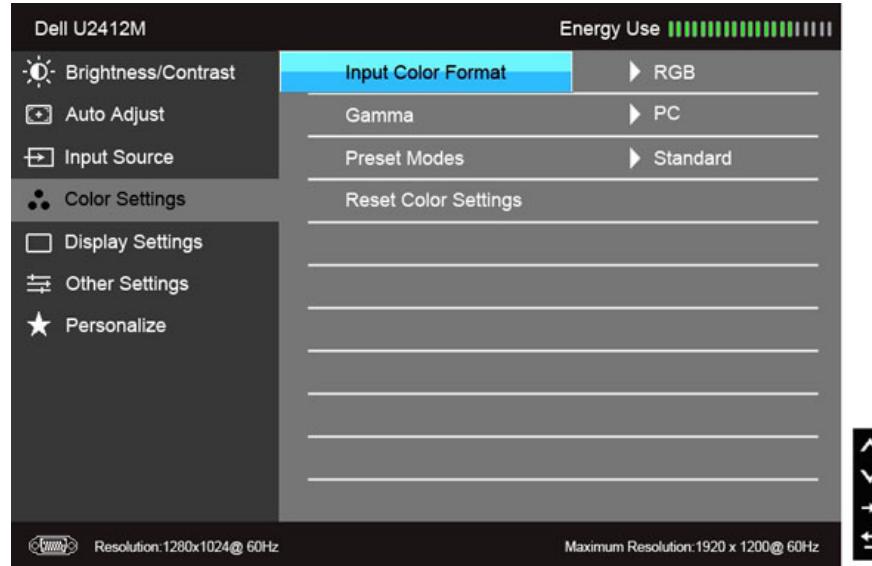
Within the preset modes menu there are options for standard, multimedia, movie, game, text, colour temp. and custom colour.



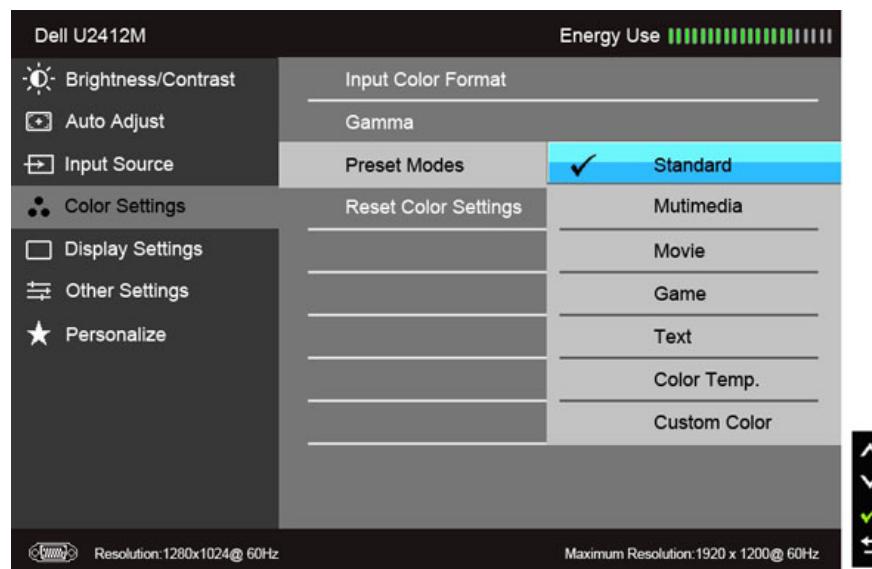
Bringing up the main menu presents you with various sub-sections down the left hand side as shown. At the top right there is a new "energy use" bar which gives you a visual indication of the power consumption at any given time. This is based on the OSD brightness setting which controls the backlight intensity, and therefore has a direct correlation to the power consumption. The brightness/contrast section is self explanatory of course. The auto adjust section is only relevant when using the analogue D-sub connection.



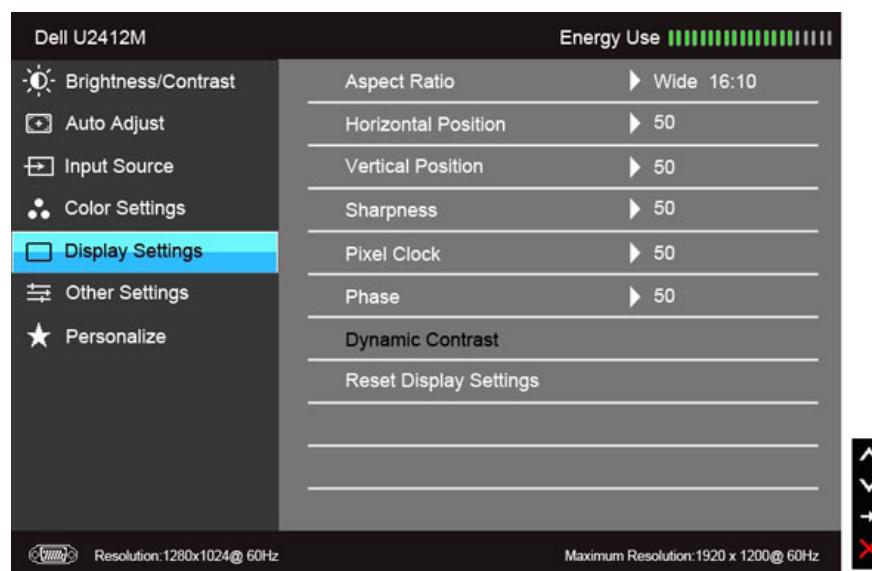
The input source section allows you to manually select which interface is in use, unless you want to use the pretty useful 'auto select' option.



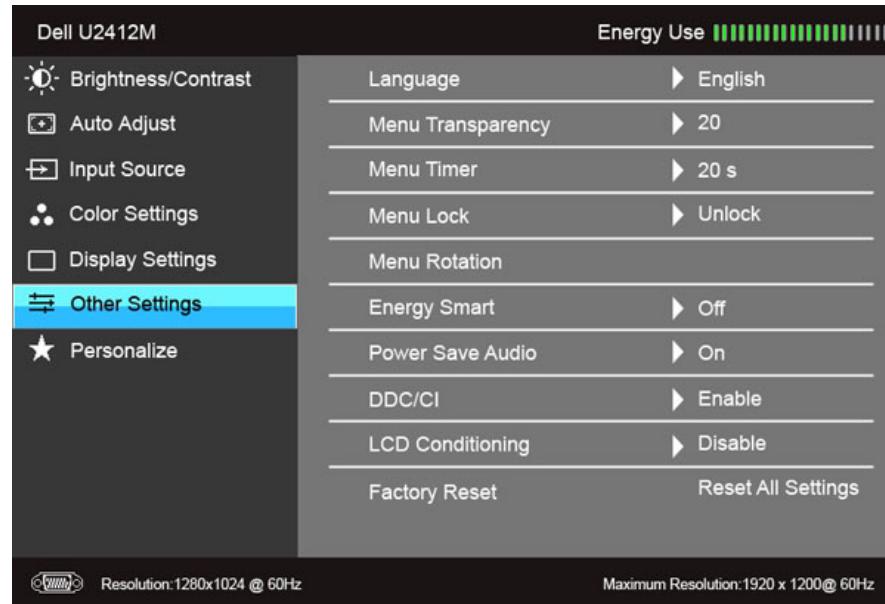
Colour settings allows you to change a couple of settings relating to colour format and gamma, but perhaps more useful here is access to the preset colour modes.



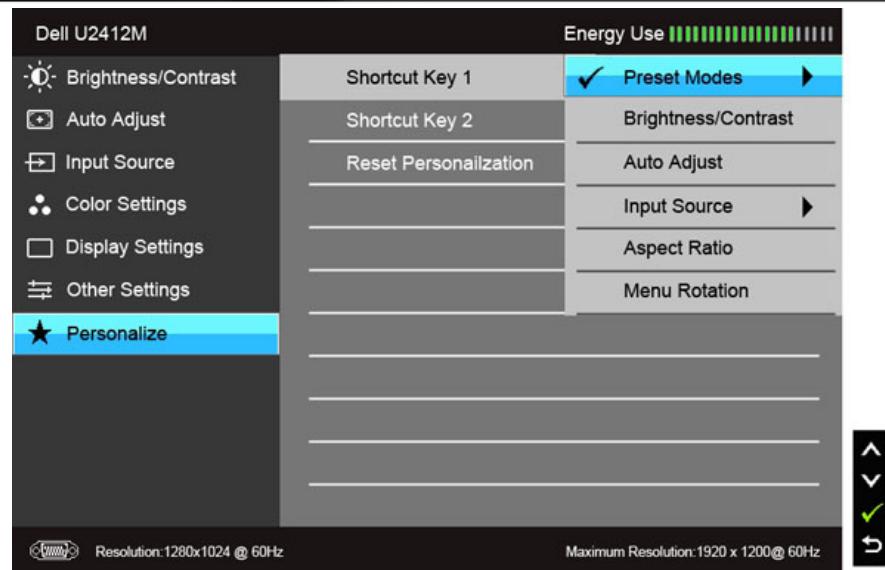
The preset modes listed here are the same as those accessed via the quick launch menu.



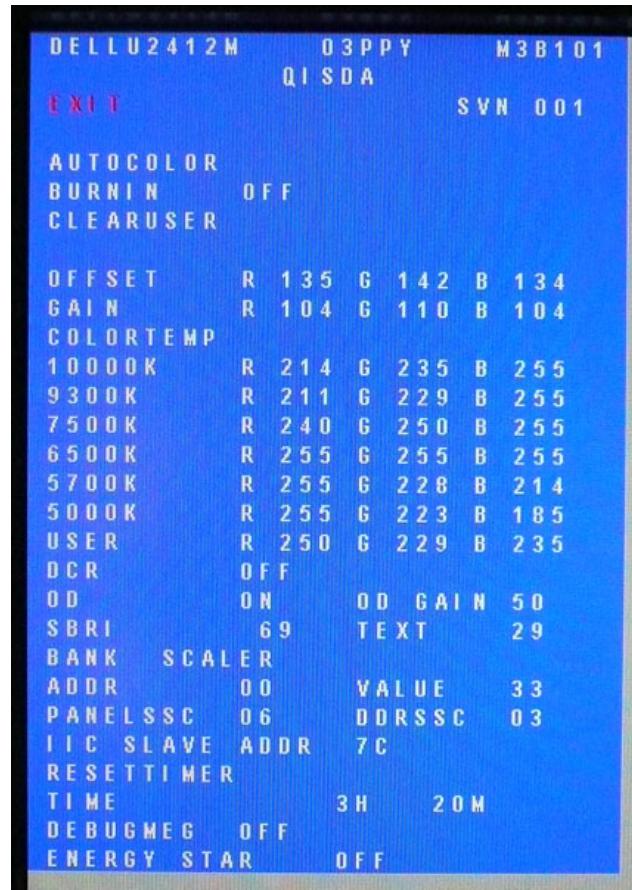
The display settings section allows you to change the monitors aspect ratio for external devices and games. There are options for wide 16:10, 4:3 and 5:4 here. You can also turn the dynamic contrast ratio control on and off in this section of the menu, if you are in a suitable preset mode where it can be activated. We will look at this [later on in the review](#).



The other settings section has some controls over the OSD itself. The 'Energy Smart' feature can be turned on and off here as well.



The personalize section allows you to change the quick launch keys if you wish.



You can access the monitors factory menu as well but be careful not to change anything without knowing what you've done or how to change it back. Use the menu at your own risk! To access the factory menu, hold the top two buttons down while powering the monitor on. Once it is on, press the top button to bring up the menu. You can define the RGB levels for each of the colour temp preset modes here and there are a few other settings relating to the operation of the display. Perhaps of some interest here is the ability to turn the overdrive ("OD") function on and off. By default it is turned on, but we will test both settings [later on in the review](#) out of interest.

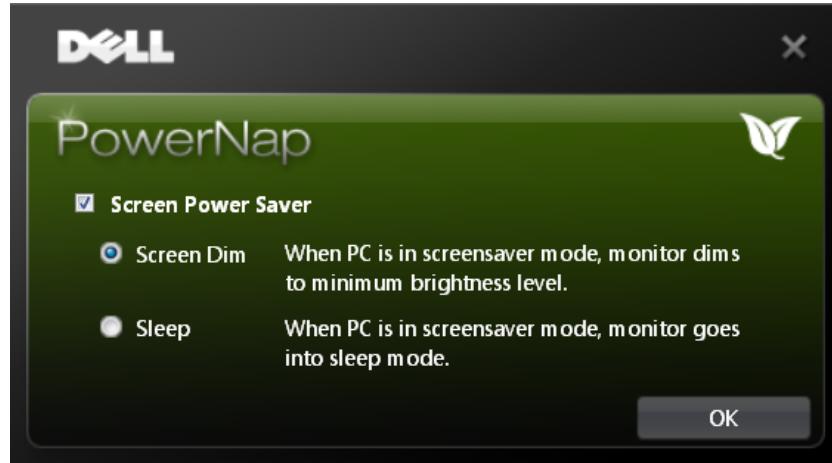
Overall the OSD menu offers a decent range of options and it is intuitive and well structured. No issues here.

## Power Consumption

**Innovative power management features**

PowerNap lets you dim the panel's brightness level or put it into sleep mode. Dynamic dimming can automatically dim onscreen brightness, while the Energy usage bar on the OSD menu allows you to see the U2412M's energy consumption at a glance.

Dell's new PowerNap software comes on the CD that shipped with the monitor. This software provides a Power Saving mode for your monitor. The Power Saving mode lets users set the monitor to "Screen Dim" or "Sleep" when your PC enters the screen saver mode.



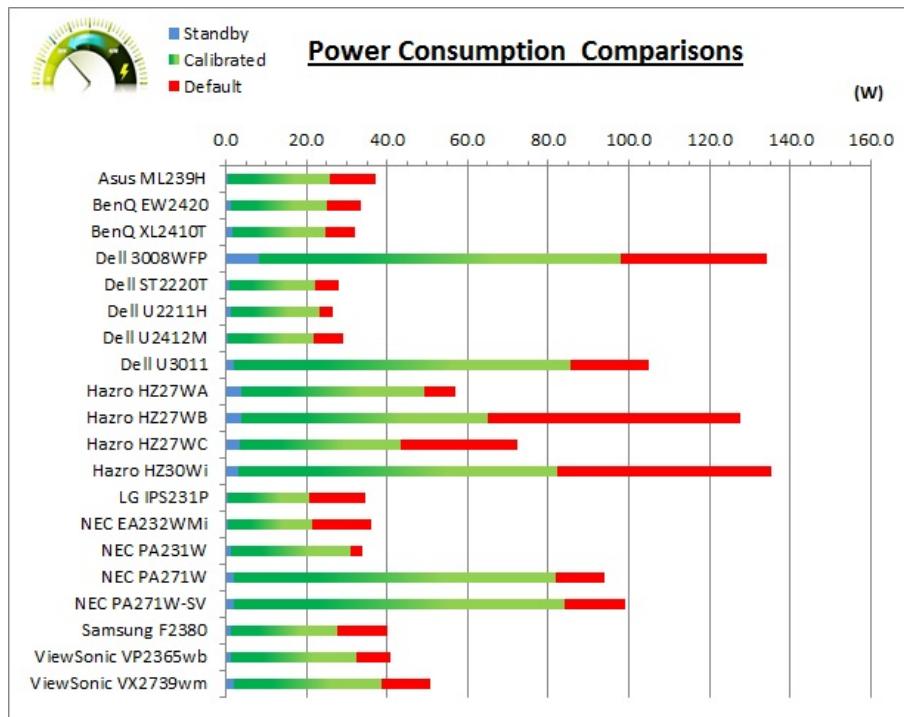
1. Screen Dim - the monitor dims to a minimum brightness level when the PC is in the screen saver mode.
2. Sleep - the monitor enters the sleep mode when the PC is in the screen saver mode.

In terms of power consumption the manufacturers spec states typical usage of 38W in normal operation and 72W maximum. They do not list a standby power consumption in their spec.



State and Brightness Setting	Power Usage (W)
Factory Default (75%)	29.3
Calibrated (35%)	21.7
Maximum Brightness (100%)	34.9
Minimum Brightness (0%)	14.1
Standby	0.6

We tested this ourselves and found that out of the box the screen used 29.3W of power while at its default 75% brightness setting. After calibration, where we had adjusted the brightness control to 35% and therefore the backlight intensity, this was reduced to 21.7W. In standby the screen uses only 0.6W of power. This was very comparable of course to the other W-LED + IPS models we have tested when you compare calibrated and standby power consumptions. I have plotted the results of these measurements on the graph below:





### Eco-design

The U2412M monitor is made from environmentally responsible materials, and meets the latest environmental standards such as ENERGY STAR®, EPEAT Gold and TCO Certified Displays.

## Colour Accuracy, Black Depth and Contrast

### The Panel and Backlighting Unit

The Dell U2412M utilises an LG.Display LM240WU8-SLA2 e-IPS panel ([datasheet link](#)) which is capable of producing 16.7 million colours. The panel itself actually uses a 6-bit colour depth with Advanced frame rate control (A-FRC) to produce the 16.7m colours. This is different to regular 8-bit IPS matrices, but this is a measure taken to achieve a lower price point for these modern lower-cost displays. Studying detailed information from LG.Display's datasheet confirms the panel is indeed 6-bit + A-FRC.

The U2412M uses [White-LED \(W-LED\) backlighting](#). The colour space of this screen is approximately equal to the sRGB reference and is considered a 'standard gamut' backlight type. Studying the detailed panel spec confirms the screen covers 71% of the NTSC reference, 74.3% of the Adobe RGB reference and 95.8% of the sRGB space. As a side note you will see reference on Dell's website of an 82% colour gamut. This refers to the NTSC coverage but is based on a different reference point (CIE1976 = 82%). More common is the CIE1931 standard which would equate to 72% NTSC which is more relevant when comparing with other screens quoting NTSC gamut specs. While a 95.8% coverage of the sRGB space is decent enough and in line with most W-LED backlit screens, some higher end uses may require a wider gamut with a full 100% sRGB coverage (and beyond) for graphics and colour work. A wide gamut screen is another option for those wanting to work outside of the sRGB colour space.

### Testing Methodology

An important thing to consider for most users is how a screen will perform out of the box and with some basic manual adjustments. Since most users won't have access to hardware colorimeter tools, it is important to understand how the screen is going to perform in terms of colour accuracy for the average user.

I restored my graphics card to default settings and disabled any previously active ICC profiles and gamma corrections. The screen was tested at default factory settings using the DVI interface, and analysed using an [X-rite i1 Pro](#) spectrophotometer combined with [LaCie's Blue Eye Pro](#) software suite. An NEC branded and customised X-rite i1 Display 2 colorimeter was also used to verify the black point and contrast ratio since the i1 Pro is less reliable at the darker end.

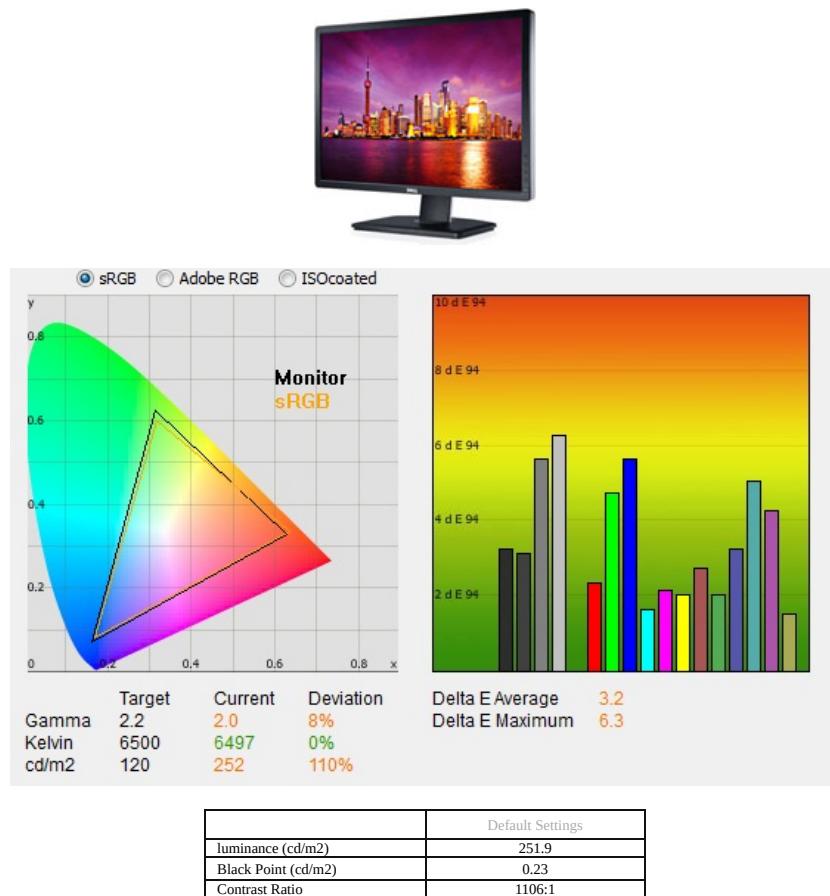
### Targets for these tests are as follows:

- **CIE Diagram** - validates the colour space covered by the monitors backlighting with the black triangle representing the display
- **Gamma** - we aim for 2.2 which is the default for computer monitors
- **Colour temperature / white point** - we aim for 6500k which is the temperature of daylight
- **Luminance** - we aim for 120 cd/m<sup>2</sup>, which is the recommended luminance for LCD monitors in normal lighting conditions
- **Black depth** - we aim for as low as possible to maximise shadow detail and to offer us the best contrast ratio
- **Contrast ratio** - we aim for as high as possible. Any dynamic contrast ratio controls are turned off here if present
- **dE average / maximum** - as low as possible. If DeltaE >3, the color displayed is significantly different from the theoretical one, meaning that the difference will be perceptible to the viewer. If DeltaE <2, LaCie considers the calibration a success; there remains a slight difference, but it is barely undetectable. If DeltaE < 1, the color fidelity is excellent.

Default settings of the screen were as follows:

Monitor OSD Option	Default Settings
Brightness	75
Contrast	75
RGB Channels	n/a
Preset Mode	Standard

Dell U2412M - Default Factory Settings



The out of the box performance of the U2412M was reasonable. The [CIE diagram](#) on the left confirms that the monitors colour gamut (black triangle) very closely matches the sRGB colour space (orange triangle). It extends a little past the sRGB space in greens in this 2D view of gamut but is a little short in reds. Default gamma was recorded at 2.0 average, leaving it 8% out from the target of 2.2 on average. Gamma was actually close to the target in darker greys but deviated as low as 1.88 in lighter shades.

White point was excellent here and almost spot on to the target at 6497k (<0.5% deviance) which shows a good factory set up in this area. Note that we are using a Spectrophotometer to make these measurements which is not sensitive to the W-LED backlight as some colorimeter devices can be. When using a colorimeter with a W-LED backlit screen there can be a typical deviance of 500 - 600k in the white point measurement which is why some source may refer to a lower white point in this test incorrectly.

Luminance was recorded at a high 251.9 cd/m<sup>2</sup> which is too high for comfortable use. The OSD is set at 75% brightness and this is still too much. Even at this high 251.9 cd/m<sup>2</sup> luminance, the black depth was a very good 0.23 cd/m<sup>2</sup>. This gave us a static contrast ratio of 1106:1 which is excellent for an IPS panel.

Colour accuracy was mediocre at default factory settings with an average DeltaE (dE) of 3.2, ranging up to a maximum of 6.3. The screen felt quite even to the naked eye although overly bright at these default settings. Some minor OSD adjustments to the brightness can hopefully help improve the default set up for casual users who don't have access to a hardware calibration device.

We also tested the 'Custom Color' preset mode. The luminance of the screen jumped up a little to 269 cd/m<sup>2</sup> but the rest of the measurements remained pretty much identical to the standard mode. This preset is obviously just set up the same as the 'standard' preset, but does then allow you access to the individual RGB channels for adjustments and calibration.

## Testing Colour Temperatures

The U2412M features a preset which we have not seen on previous models, that being the 'Color Temp' mode. Once selected you are presented with a range of options ranging from 10,000k to 5000k, depending on how cool or warm you want your white point to be. We have already seen that the 'standard' preset mode which is selected out of the box returns a white point / colour temperature of 6497k, basically spot on to the target of 6500k which is the temperature of daylight, and a target which many users will want to aim for during calibration.

We measured the colour temperature of the screen with the X-rite i1 Pro spectrophotometer in each of the preset modes to establish how accurate the settings actually were. All other settings were left at factory defaults and no ICC profile was active. The results are recorded below:

Selected Preset Mode	Measured Colour Temperature
10000k	8010k
9300k	8348k
7500k	7005k
6500k	6465k
5700k	5706k
5000k	4922k
Standard	6457k
Multimedia	6468k
Movie	8415k
Game	6507k
Text	6450k

As you can see, there is a reasonable deviance between the supposed colour temp mode and that actually recorded at the cooler settings. There is about 2000k difference in fact when in the 10000k mode, with colour temperature only being measured at 8010k. The 7500k mode is a bit closer at 7005k. Thankfully the other warmer modes are much more accurate. The 6500k mode is the same as the 'standard' preset in fact and was pretty much spot on to the target colour temp. The 5700k and 5000k modes were also very close to the target.

We also measured the colour temperature of each of the named preset modes as shown above. The 'movie' mode makes the image a bit cooler, while 'text' is a little warmer than the other modes here.

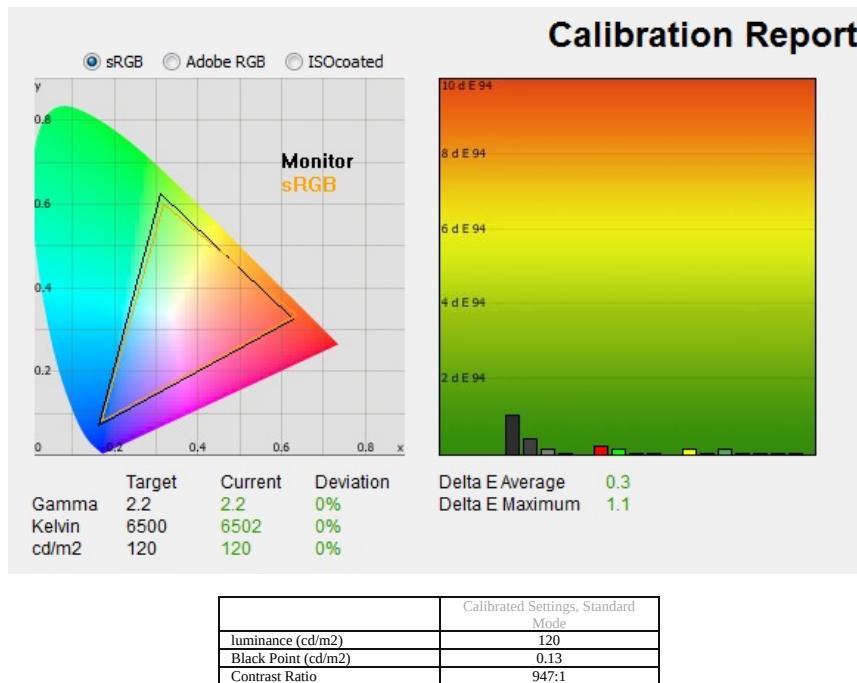
## Calibration Results



I wanted to calibrate and profile the screen to determine what was possible with optimum settings and profiling. I used the [X-rite i1 Pro spectrophotometer](#) combined with the LaCie Blue Eye Pro software package to achieve these results and reports. An NEC branded and customised X-rite i1 Display 2 was used to validate the black depth and contrast ratios due to lower end limitations of the i1 Pro device.

### Dell U2412M - Calibrated Settings, Standard Mode

Monitor OSD Option	Adjusted Setting
Brightness	35
Contrast	75
Preset Mode	Standard
RGB Controls	n/a



I first of all remained in the default 'standard' preset mode. This preset does not allow you to adjust the individual RGB channels so the only hardware adjustments I would be making potentially are to the brightness and contrast levels. I followed LaCie's calibration process through, adjusting the OSD brightness setting in line with the recommendations made in the process, and then letting the software carry out the LUT adjustments at a graphics card level and create an [ICC profile](#). The screen does not feature a hardware LUT calibration option so other than the OSD alterations, the rest of the process is carried out at a graphics card level in profiling the screen.

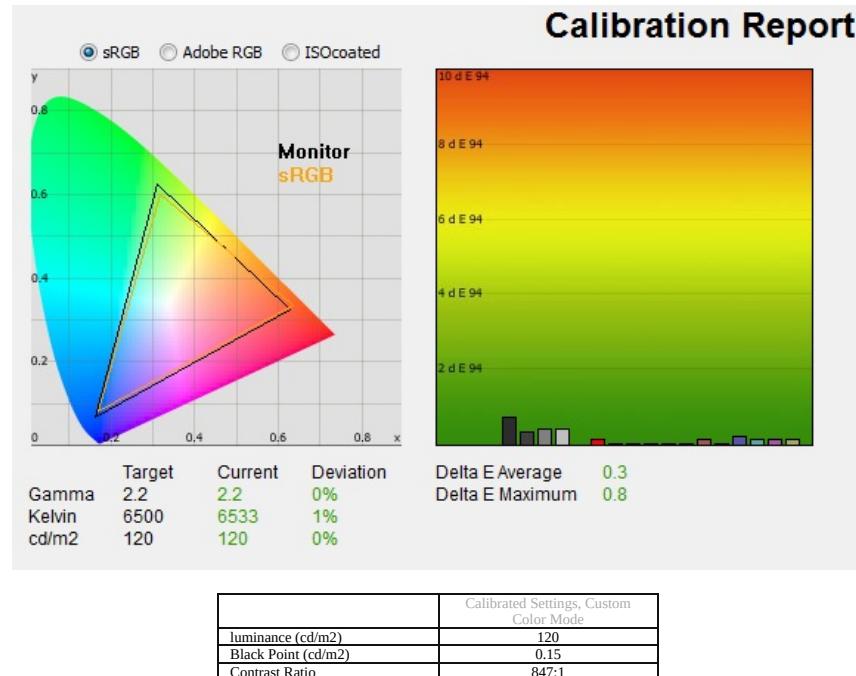
The calibration was a great success. The gamma discrepancy that we saw before (8%) had been corrected now to leave us with 0% deviance from the target of 2.2 and white point was basically spot on at 6502k as it had been at default settings. Luminance had been reduced to a more comfortable 120 cd/m<sup>2</sup> after the adjustment of the OSD brightness control to 35%. Black depth was still very good at 0.13 cd/m<sup>2</sup> and this gave us an excellent calibrated static contrast ratio of 947:1. Colour accuracy was also improved nicely with dE average now only 0.3 and maximum only 1.1. LaCie would consider colour fidelity to be excellent.

Testing the screen with various colour gradients showed smooth transitions with no sign of any obvious colour banding. There was some slight gradation evident in darker tones but overall no issues, and nothing that you don't see on most screens. There was also some slight temporal noise evident, particularly in darker tones if you look very closely. This is a result of the FRC algorithm used to produce the 16.7 million colour palette. It's not something you'd notice in practice, and you do have to look very closely to see it. In reality although the panel used is a 6-bit + A-FRC module, there is no noticeable issue with this in terms of colour gradation and performance.

You can use our settings and try our calibrated ICC profile if you wish, which are available in [our ICC profile database](#).

#### Dell U2412M - Calibrated Settings, Custom Color Mode

Monitor OSD Option	Adjusted Setting
Brightness	35
Contrast	75
Preset Mode	Custom Color
RGB Controls	98, 90, 92

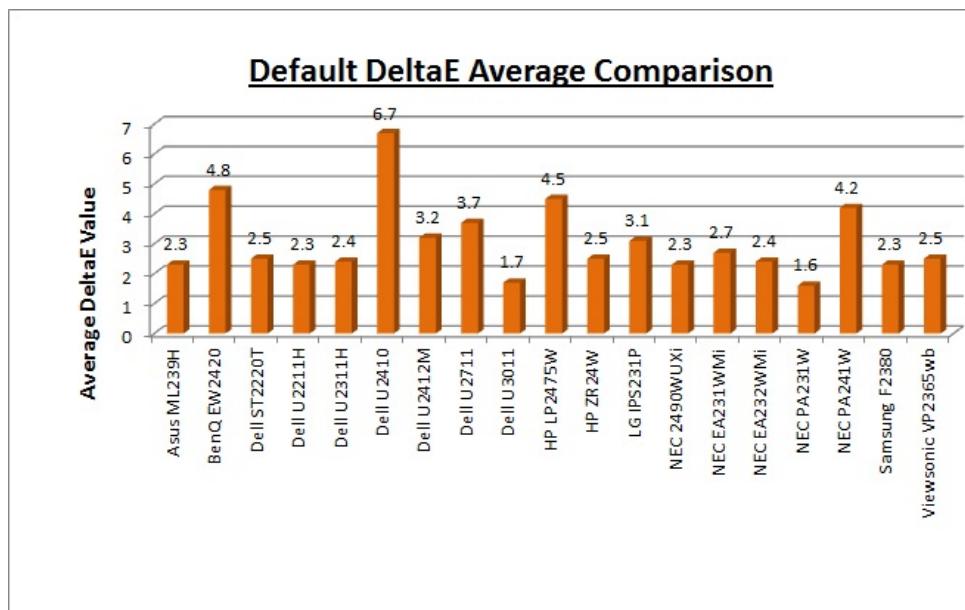


I switched to the 'Custom Color' preset mode for this process as it would allow me to change the individual RGB channels. I followed LaCie's calibration process through, adjusting the OSD settings in line with the recommendations made in the process, and then letting the software carry out the LUT adjustments at a graphics card level and create an [ICC profile](#). The screen does not feature a hardware LUT calibration option so other than the OSD alterations, the rest of the process is carried out at a graphics card level in profiling the screen.

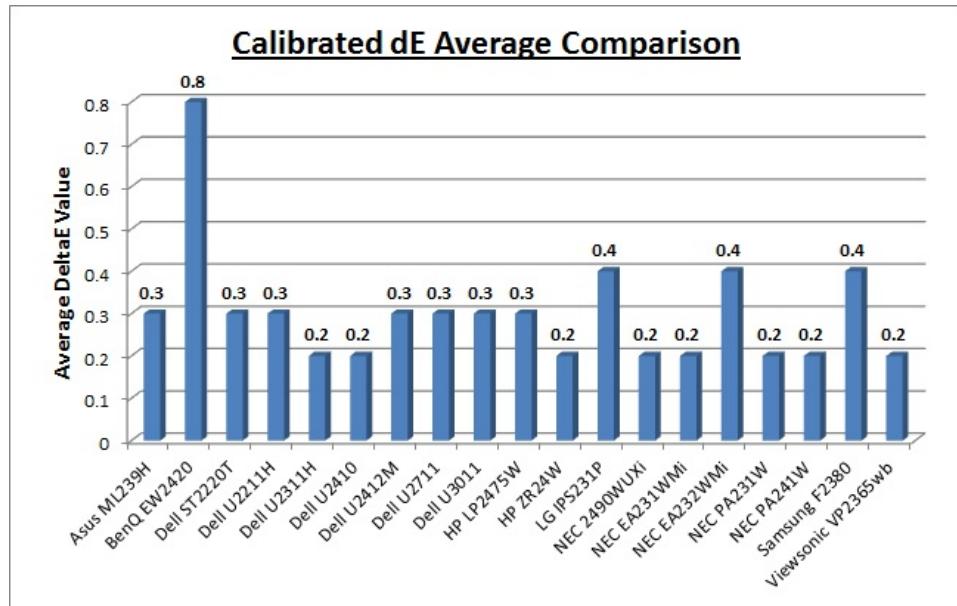
The calibration was again a success. The performance pretty much matched that of our calibrated 'standard' preset. I should note that it was initially quite difficult to calibrate in this mode, with some profiles creating a blue tint strangely. This seemed to be related to the chosen RGB levels, but after several attempts we reached the settings above which produced a pleasing result. With a reduction in the RGB levels you are also affecting the contrast ratio of the screen a little, and so calibrated static contrast ratio was 100 lower in this 'custom color' mode than it had been in the 'standard' mode, being recorded at 847:1. I can't see any reason why you might use this mode above the 'standard' mode to be honest, as long as you can make some corrections through calibration and profiling.

Again, you can use our settings and try our calibrated ICC profile if you wish, which is available in [our ICC profile database](#).

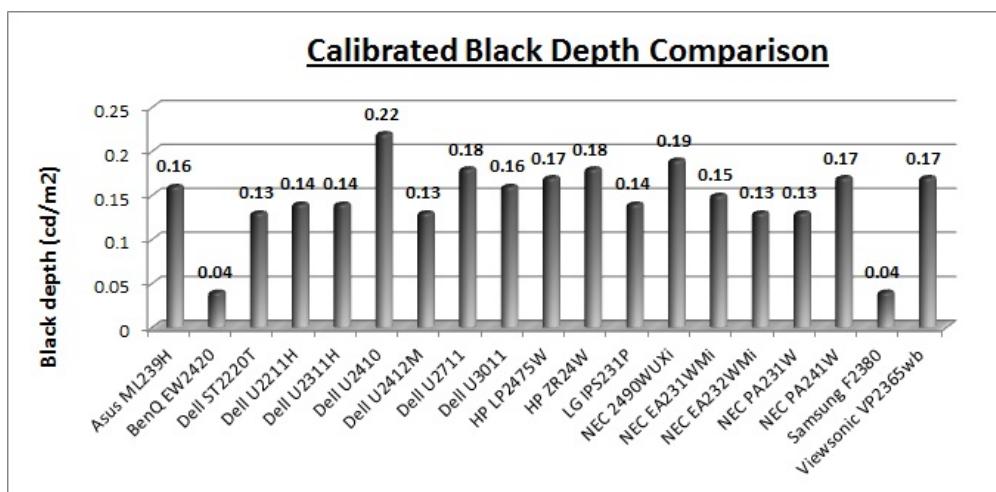
## Calibration Performance Comparisons

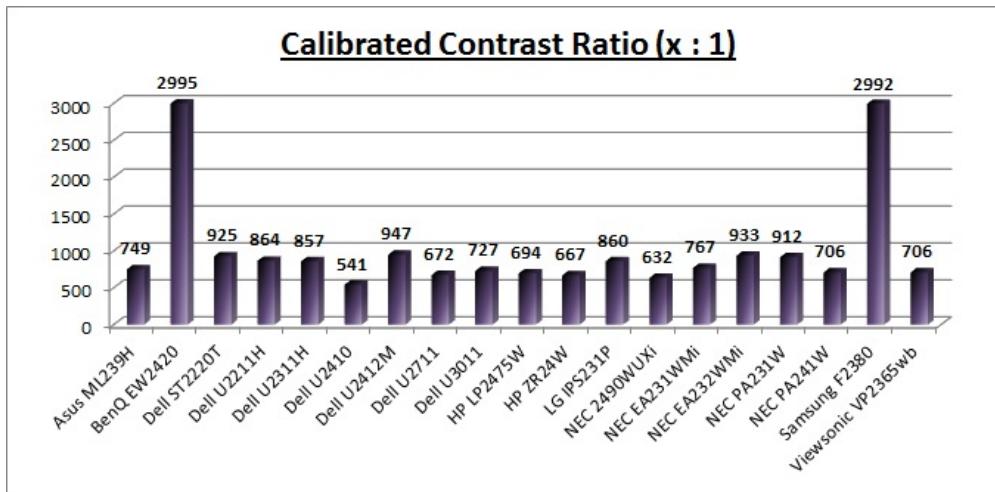


I've provided a comparison above of the U2412M against some of the other screens we have tested in a similar size range. Out of the box average dE was 3.2 on the U2412M which was mediocre. It was better than the [BenQ EW2420](#). That model used one of AU Optronics' AMVA panels with W-LED backlighting and was worse at 4.8. The default colour accuracy of the U2412M was comparable, although not quite as good, as some of the 23" IPS models we have tested including the [Dell U2311H](#) (2.4), [NEC EA231WMi](#) (2.7) and [ViewSonic VP2365wb](#) (2.5). Even though the U2412M was a little higher at 3.2 this is a minimal difference really out of the box. Some of the 23" IPS + W-LED screens we have tested are also quite similar such as the [NEC EA232WMi](#) (2.4), [LG IPS231P](#) (3.1) and the [Asus ML239H](#) (2.3). The professional grade 23" [NEC PA231W](#) was better still at 1.6 dE average. A reasonable performance in terms of default colour accuracy from the U2412M and only a little behind the competition really. Some form of software profiling using a colorimeter would of course be beneficial to correct some of the colours.



Once calibrated the dE average was reduced to 0.3. This would be classified as excellent colour fidelity by LaCie. It was not quite as low as some of the other screens here which reached down to 0.2 average, but in practice you would not notice any difference here. Some of the professional range models from NEC are even more accurate. Professional grade monitors like the NEC PA series also offer other high end features which separate them from some of these other models, including extended internal processing, 3D LUT's and hardware calibration. These comparisons are based on a small selection of tests, so it should be remembered that other factors do come into play when you start talking about professional use. For further information and tests of a high end professional grade screen with hardware LUT calibration, you may want to have a read of our [NEC SpectraView Reference 271 review](#).





The black depth and contrast ratio of the U2412M were excellent for an IPS panel. Calibrated black depth was  $0.13 \text{ cd/m}^2$  which was as good as any of the other IPS + W-LED screens we have tested (ranging between  $0.13$  and  $0.16 \text{ cd/m}^2$ ). The U2412M showed an improved black level as compared with the U2410 (0.22) which was pleasing. A static contrast ratio of 947:1 was produced which was the highest of all the IPS based models listed here. It was again quite a decent improvement compared with the 541:1 of the U2410. The BenQ EW2420 and Samsung F2380 with their AMVA and cPVA panels respectively offered some fantastic contrast ratios of  $\sim 3000:1$  which IPS cannot compete with at the moment however.



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## Contrast Stability

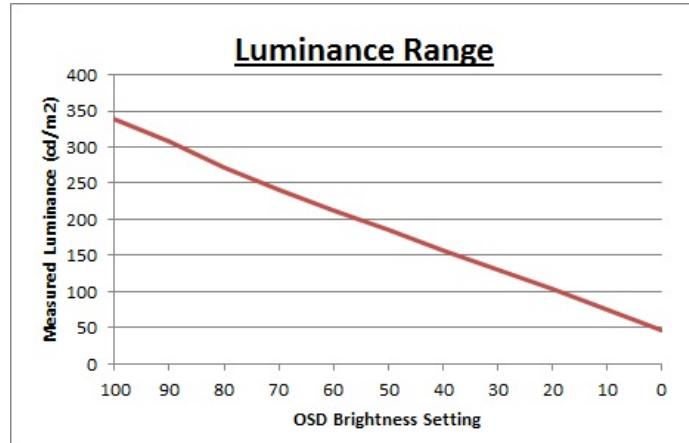
I wanted to see how much variance there was in the screens contrast as we adjusted the monitor setting for brightness. In theory, brightness and contrast are two independent parameters, and good contrast is a requirement regardless of the brightness adjustment. Unfortunately, such is not always the case in practice. We recorded the screens luminance and black depth at various OSD brightness settings, and calculated the contrast ratio from there. Graphics card settings were left at default with no ICC profile or calibration active. Tests were made using an NEC branded and customised X-rite i1 Display 2 colorimeter. It should be noted that we used the BasICColor calibration software here to record these, and so luminance at default settings may vary a little from the LaCie Blue Eye Pro report.

OSD Brightness	Luminance (cd/m <sup>2</sup> )	Black Point (cd/m <sup>2</sup> )	Contrast Ratio (x:1)
100	339	0.30	1131
90	309	0.27	1145
80	272	0.24	1133
70	240	0.21	1142
60	213	0.19	1119
50	185	0.16	1159
40	158	0.14	1131
30	131	0.11	1189
20	103	0.09	1147
10	75	0.07	1075
0	46	0.04	1155

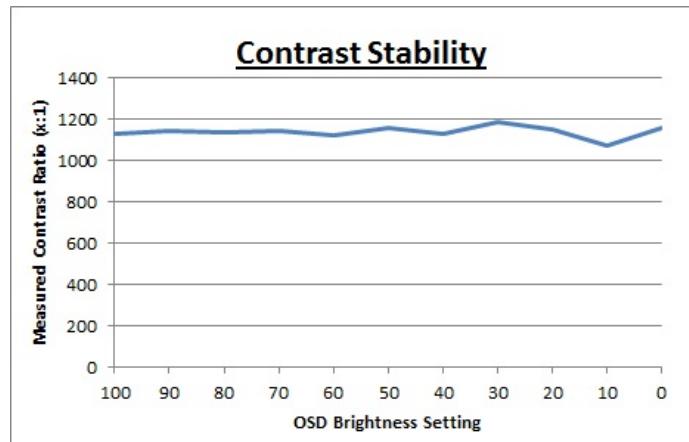
**Luminance Adjustment Range** =  $293 \text{ cd/m}^2$   
**Black Point Adjustment Range** =  $0.26 \text{ cd/m}^2$   
**Average Contrast Ratio** = 1139:1

The luminance range of the screen was very impressive and the brightness control allowed you to vary the W-LED backlight intensity from  $339 \text{ cd/m}^2$  at maximum 100%, all the way down to a very low  $46 \text{ cd/m}^2$  at 0%. In fact the maximum brightness was a little above even the quoted maximum brightness spec of the screen (300). There was  $293 \text{ cd/m}^2$  worth of adjustment range available here which should easily allow you to obtain a comfortable setting for your working environment. Even those who prefer very low luminance settings should be fine here with the lower range available. A setting of around 26% should offer you a luminance of  $\sim 120 \text{ cd/m}^2$ .

Black depth was reduced as one would hope as you lower the brightness control. This ranged from  $0.30 \text{ cd/m}^2$  at the top end down to a very low  $0.04 \text{ cd/m}^2$  at the low end.



We have plotted the luminance trend on the graph above. The screen behaves as it should, with a reduction in the backlight intensity controlled by the reduction in the OSD brightness setting.



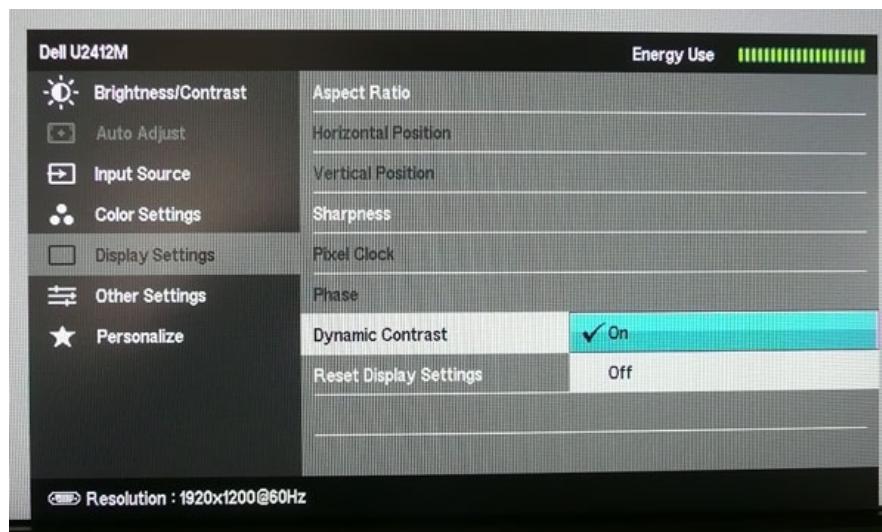
Static contrast ratio remained pretty even across the adjustment range, with an average figure of 1139:1 which was impressive. It was a little less stable at the lower end of the brightness range below a setting of ~40%. These contrast measurements were plotted on the graph shown above.

## Dynamic Contrast



The Dell U2412M features a dynamic contrast ratio (DCR) control, which boasts a spec of 2,000,000:1 (2 million:1).

Dynamic contrast ratio involves controlling the backlight of the screen automatically, depending on the content shown on the screen. In bright images, the backlight is increased, and in darker images, it is decreased. For this test I would use the colorimeter to record the luminance and black depths at the two extremes. Max brightness would be recorded on an all white screen once the DCR has caught up. Black depth would be recorded on an all black screen.



The DCR feature is only available in the 'movie' and 'game' presets. The brightness control remains active in the OSD menu and is not greyed out as it is on some screens. However, if you change those setting manually it will prompt you and tell you that in doing so, the DCR function will be disabled. You can turn the DCR function on or off in the display settings section of the menu should you want to.

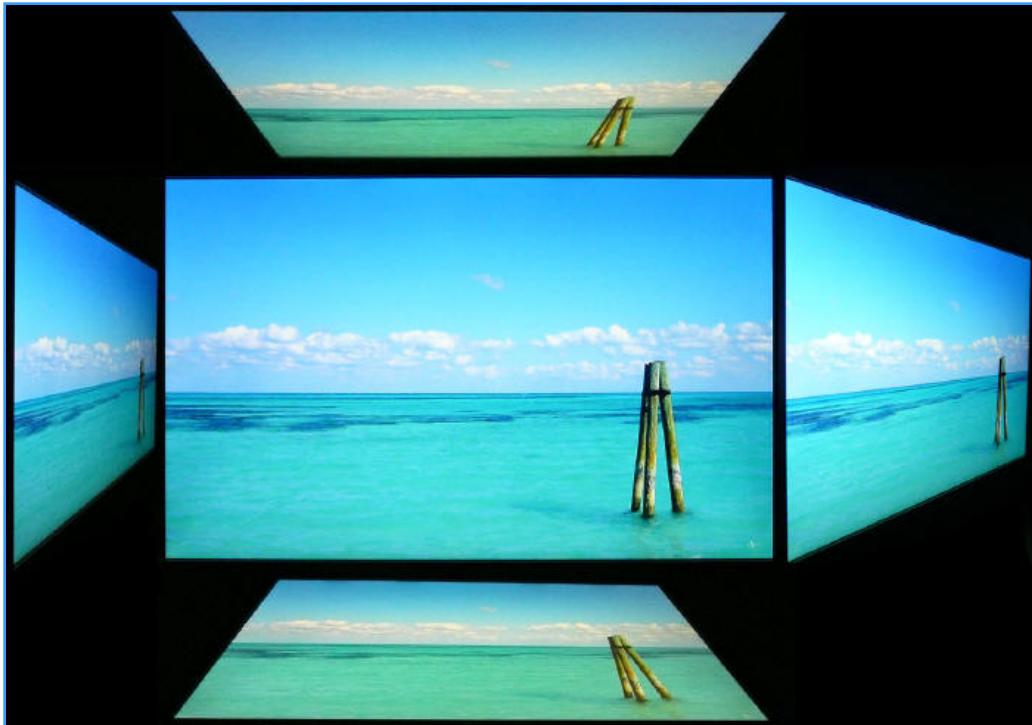
	Dynamic Contrast
Specified DCR Range	2 million : 1
Available in Presets	Game, Movie
Settings	On / Off
Max luminance (cd/m <sup>2</sup> )	217
Min Black Point (cd/m <sup>2</sup> )	0.30
Max Dynamic Contrast Ratio	726:1

The tests that we carry out to measure dynamic contrast ratio involve an *almost* completely white and *almost* completely black screen. In real use you are very unlikely to ever see a full black or full white screen, and even our tests are an extreme case to be honest. Carrying out the tests in this way does give you a good indication of the screens dynamic contrast ratio in real life situations however.

Carrying out this test didn't seem to make use of the DCR at all. There was no noticeable change in the backlight intensity when changing between images of different levels of white and black, even when switching between an almost completely white, and an almost completely black image. Watching the OSD menus energy bar also allowed you to see what was being changed and it remained static throughout. Our colorimeter recorded maximum luminance as 217 cd/m<sup>2</sup> and minimum black depth of 0.30 cd/m<sup>2</sup>. This gave us a contrast ratio which was in fact much lower than the the default static contrast ratio and was recorded at 726:1. The DCR didn't seem to work at all. Nothing particularly surprising considering some of the DCR performances we have seen from many other models.

However, the feature *can* work, but only in the most unrealistic and extreme circumstances. Like the Asus ML239H and LG IPS231P that we tested recently, if you display an all black screen (completely black) then the feature "works". You can see a change when viewing an all black screen which takes about 4.5 seconds to happen. If you bring up the OSD menu and switch to a completely black screen you can see the green energy meter lowering slowly from maximum, to minimum. Unlike the Asus and LG models however we did not see the backlight being turned completely off and so what you are basically doing is controlling the full range of the backlight intensity in the space of around 4.5 seconds. In real use you are never going to have a 100% black screen so this features use is very questionable. If it did operate under less extreme circumstances you could in theory get a maximum luminance of 339 cd/m<sup>2</sup> and a minimum black level of 0.04 cd/m<sup>2</sup>. Those figures are taken from our contrast stability section and would in theory give you a dynamic contrast ratio of ~8475:1. That would be a pretty good figure actually and may be of use to some people. The screen would never live up to its 2 million:1 spec though as you would have to be turning the backlight off to reach a lower black point. In fact it would be then tending towards infinity:1 if you consider its black point is basically then 0 cd/m<sup>2</sup>. However, in practice you are never going to be able to see a DCR range like that. In fact in normal use the DCR doesn't seem to operate at all. Another marketing gimmick and a disappointing trend we've seen.

## Viewing Angles



Above: Viewing angles shown from front and side, and from above and below. Click for larger image

Viewing angles of the Dell U2412M are very good, as you would expect from a screen based on an e-IPS panel. Horizontally there are very wide fields of view with a small contrast shift only really becoming noticeable from a fairly wide angle of about 45°. At more extreme angles the image goes a little darker. Vertically, the contrast shift was a little more pronounced but the fields of view were still good. Vertically there is a slight yellow hue noticeable as you move your field of view away from a central position. This is only really a problem at extreme angles though. The panel is free from any off-centre contrast shift which you see from VA matrices, and this is why IPS technology is so highly regarded in the colour enthusiast and professional space. It is also free of the very noticeable contrast and colour tone shifts you see from TN Film panels vertically.

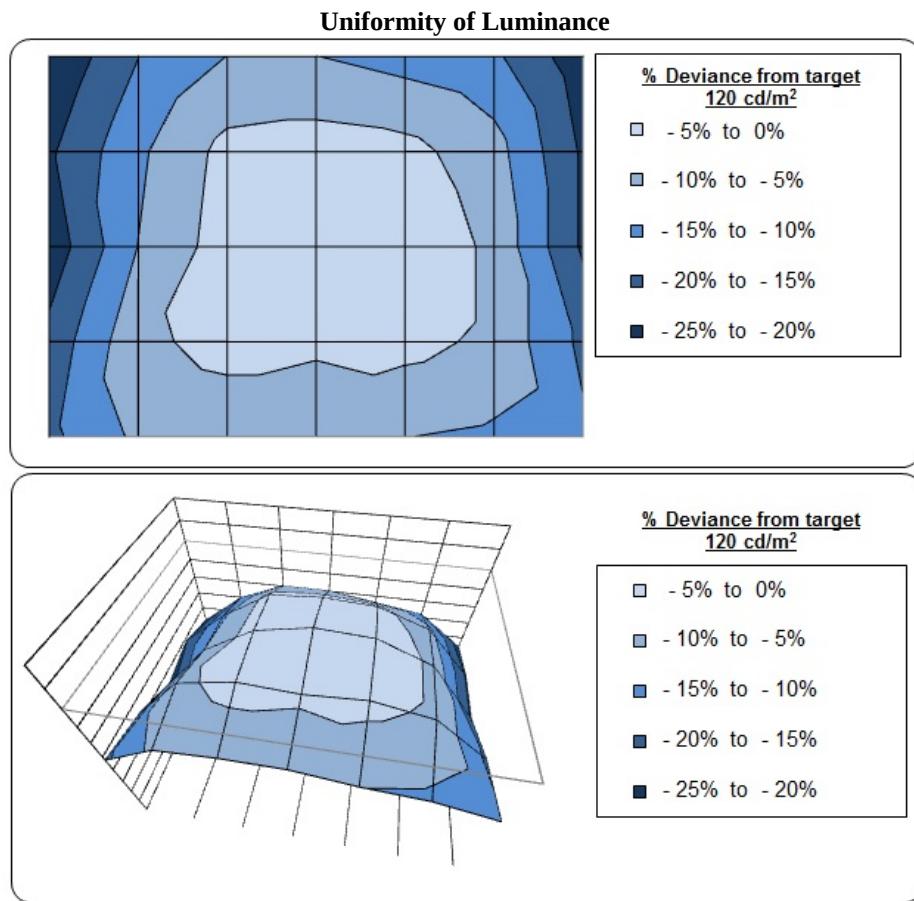


Above: View of an all black screen from the side. Click for larger version

On a black image there is a characteristics IPS white glow, but in normal lighting conditions this shouldn't present much problem. The above image was taken in a darkened room to demonstrate the white wide angle glow. There is no A-TW polarizer on this panel which is rarely used now in the market but was implemented on some older screens to improve the off centre black viewing.

## Panel Uniformity

Measurements of the screens luminance were taken at 35 points across the panel on a pure white background. The measurements were taken using BasICColor's calibration software package, combined with the NEC customised X-rite i1 Display 2 colorimeter. The above uniformity diagram shows the difference, as a percentage, between the luminance recorded at each point on the screen, as compared with the reference point of a calibrated  $120 \text{ cd/m}^2$ . This is the desired level of luminance for an LCD screen in normal lighting conditions, and the below shows the variance in the luminance across the screen compared with this point. It is worth noting that panel uniformity can vary from one screen to another, and can depend on manufacturing lines, screen transport and other local factors. This is only a guide of the uniformity of the sample screen we have for review.



The luminance uniformity of the U2412M sample was moderate. The maximum deviations from the central measurement of  $120 \text{ cd/m}^2$  were as low as  $100 \text{ cd/m}^2$  along the left hand edge and top left hand corner. The screen did not reach higher than the calibrated central luminance of  $120 \text{ cd/m}^2$ . Overall only 57% of the screen was within 10% deviance from the target which was not great, but 83% of it was measured within 20% deviance. The left and right hand edges of the screen were a little darker than the rest of the screen but you couldn't spot this in normal use to be honest.

## Backlight Leakage



*Above: All black screen in a darkened room. Click for larger version*

As usual we also tested the screen with an all black image and in a darkened room. A camera was used to capture the result. Overall the appearance of an all black screen appeared pretty even in this test. There was very little leakage at all which was very pleasing. The corners were a little lighter than the rest of the screen but it was very slight. No issues from the sample we had in this regard.

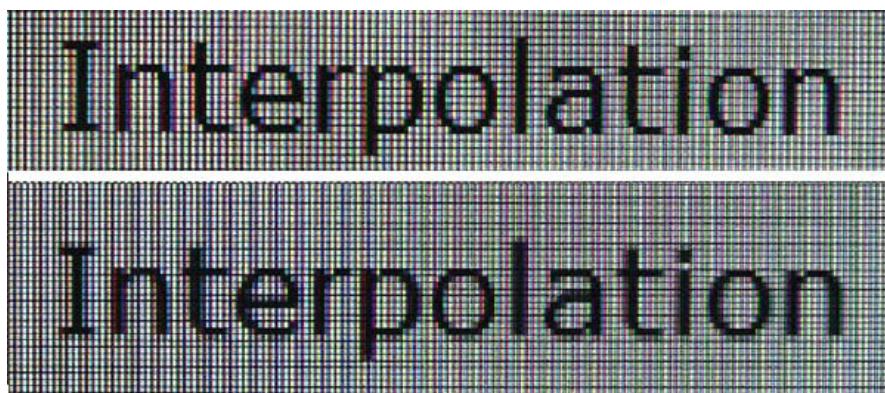
## General and Office Applications

The U2412M offers a good solution for general office and internet applications. The 1920 x 1200 resolution and 24" screen size offer a good screen real estate to work with, and side by side splitting of the screen is perfectly useable. The slightly increased vertical resolution (1200 pixels) compared with a 16:9 format screen (1080 pixels vertically) means you do gain a bit of height which is good. I personally prefer a 1920 x 1200 screen for office work so this was a welcome break for the common 16:9 aspect ratio screens in the market.

The 0.2700mm pixel pitch offers a comfortable text size for day to day use, a little bigger than some of the modern ultra-high resolution models like the 2560 x 1440 res 27" models for instance. Default luminance of the screen was recorded at 252 cd/m<sup>2</sup> which is too high for prolonged office use. You will want to turn the screen down to about 25 - 30% brightness to achieve a luminance of around 120 cd/m<sup>2</sup>. In doing so you also reduce the power consumption of the screen which is a positive thing, especially in an office environment with multiple screens set up.

I tested the screen using both the analogue D-sub and digital DVI-D interfaces. The DVI offered a slightly sharper image and better picture quality, and the D-sub was a little blurry I found. Text was still readable of course, but some clarity was lost. I would definitely recommend using the digital interface wherever possible.

The ergonomics of the screen offered a great range of adjustments. It was good to see a full range of height, tilt, pivot and swivel available and all were pretty smooth and easy to use. At least you should be able to position the screen at a comfortable setting for your individual preferences. It was also good to see some USB ports available although there are no further extra features like ambient light sensors and card readers which are often useful in office environments. The 9-in-1 card reader which appeared on the U2410 was absent here which was a bit of a shame I thought for office use. These have been left off to keep production and retail costs down.



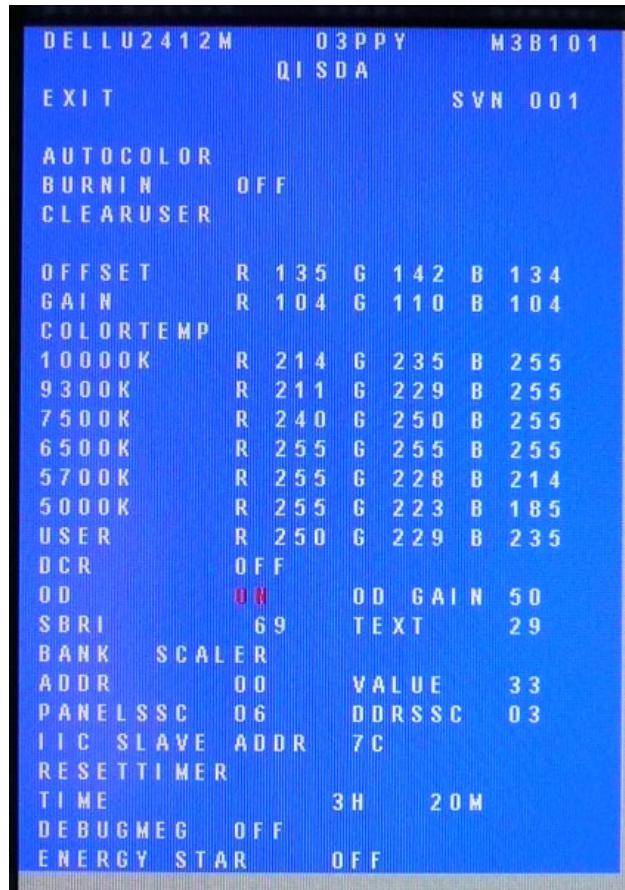
*Above: photo of text at 1920 x 1200 (top) and 1680 x 1050 (bottom)*

The screen is designed to run at its native resolution of 1920 x 1200 and at a 60Hz recommended refresh rate. However, if you want you are able to run the screen outside of this resolution. We tested the screen at a lower 1680 x 1050 resolution to see how the screen handles the interpolation of the resolution. At native resolution the text was sharp as you can see from the top photograph. When you switch to a lower resolution the text is more blurry, but not quite as severe as some other screens we have tested. There is some overlapping of the text across sub-pixels as you can see in the photo which results in this blurring. Native resolution is recommended where possible.

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## Responsiveness and Gaming

### Response Time Control



Before we get in to the get into the side by side screen comparisons I want to quickly talk about the overdrive control available through the screens factory menu. Dell have not made this option available through the normal OSD menu, but if you want, you can turn it on and off. It is labelled in the factory menu under "OD".

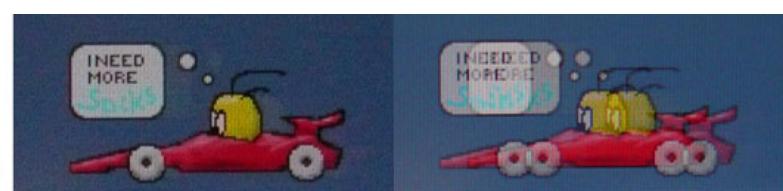


The screen was tested using the chase test in PixPerAn, a good bit of software for trying to quantify differences in real terms responsiveness between monitors. As a reminder, a series of pictures are taken on the highest shutter speed and compared. The images above are the best case examples from the U2412M with the overdrive (OD) function disabled and then enabled. When OD is turned off there is a more pronounced motion blur which is noticeable to the naked eye. It doesn't have any severe ghosting but the blur is certainly more obvious. When you enable OD the blur is reduced but there is still some motion blur detectable. While the blurring is improved quite nicely, the OD impulse does introduce a bit of an overshoot in the form of a dark trail behind the moving car. This is caused by the aggressive application of an overdrive impulse, causing the pixels to change orientation too far before reverting to the desired position. This characteristic trailing can happen on screens where overdrive impulses are applied, where it is either too aggressive (to try and boost response times even more) or poorly controlled.

In the case of the U2412M this is not too bad and should not prove a major distraction during normal use. We will look at the screens performance in more detail in a moment, but from a pixel response time point of view it is beneficial to have the OD function turned on (as it is by default).

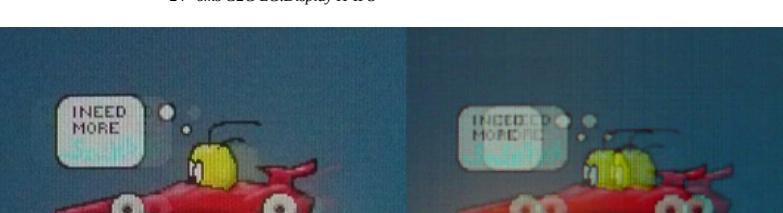
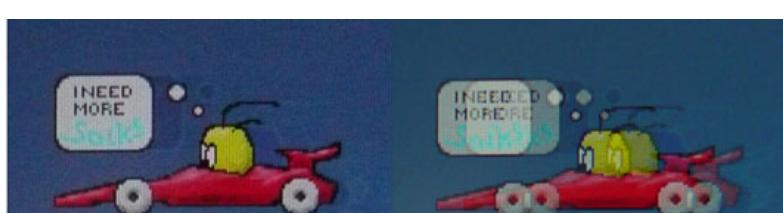
#### Display Comparisons

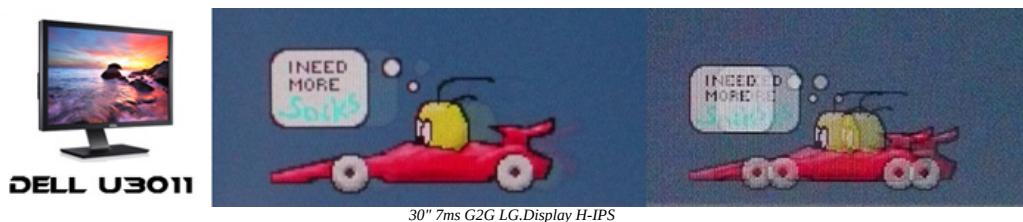
The screen was tested again using the chase test in PixPerAn for the display comparisons. As a reminder, a series of pictures are taken on the highest shutter speed and compared, with the best case example shown on the left, and worst case example on the right. This should only be used as a rough guide to comparative responsiveness but is handy for a direct comparison of the impact of this setting:



The U2412M is rated by Dell as having an 8ms G2G response time which implies the use of [overdrive / response time compensation](#) (RTC) technology, used to boost pixel transitions across grey to grey changes. We know this to be true as we have already looked at the OD function available in the factory menu. Studying the detailed spec sheet for the LM240WU8-SLA2 panel being used in this screen, LG.Display rate the panel as having a 14ms G2G 'typical' response time, and 28ms G2G 'maximum'. Dell have an overdrive circuit boosting the pixel response times as we have already tested above. Have a read about response time in our [specs section](#) if any of this is new to you.

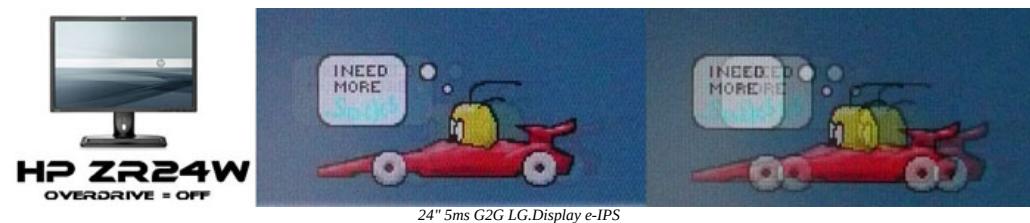
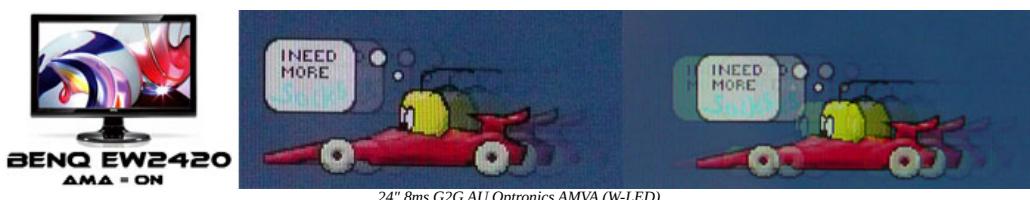
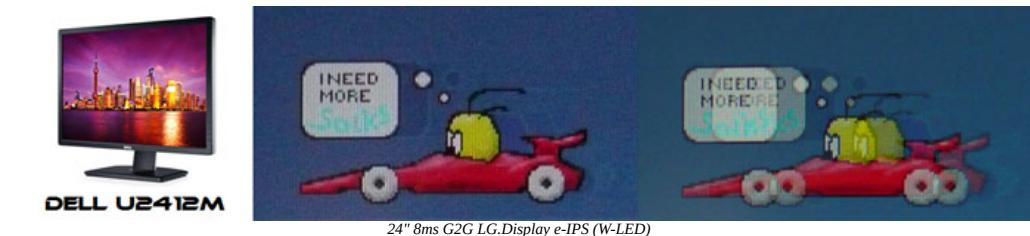
I have provided a comparison of the U2412M first of all above against 3 other screens we have tested which use IPS panel technology and W-LED backlighting. The U2412M shows less motion blur in moving images than the LG IPS231P despite its rather bold spec of 5ms G2G. In fact we had already concluded from [our review](#) that the IPS231P performed much like the NEC EA232WMi which has a 14ms response time and does not use RTC technology. This goes to show that you can't always trust a reported spec. The U2412M shows a similar low level of motion blur to the 5ms G2G rated Asus ML239H, but does have a more noticeable overshoot and dark trail unfortunately.



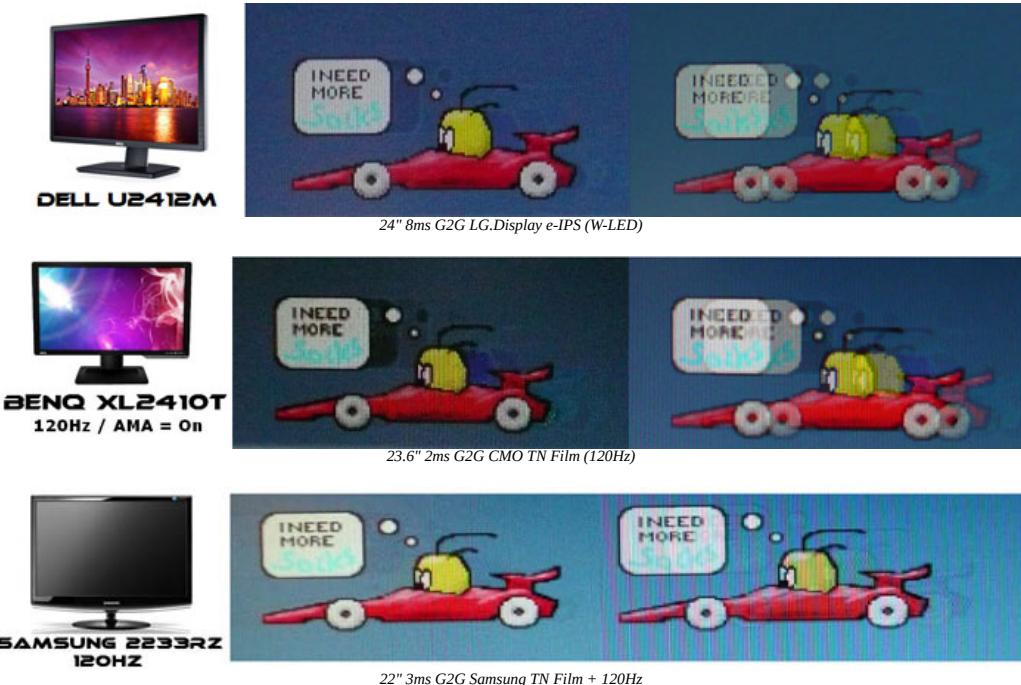


I have provided a comparison of the U2412M against some other models in Dell's monitor range. The U2412M performs quite comparably to the rest of the range overall. It shows some slight improvement compared with the U2410 in terms of motion blur but does introduce a small dark overshoot artefact unfortunately as a result. It's a tough call as to which is preferred for gaming to be honest but personally I think the U2412M has the edge slightly in practice with a smoother gaming experience.

The U2412M performs similarly to the U2311H as well although the dark overshoot of the overdrive impulse is perhaps a little more prevalent than the slightly pale overshoot seen on the 23" U2311H. The U2211H and U3011 are a tad slower with a bit more motion blur, but no obvious overshoot. The U2711 shows a more aggressive and obvious overshoot of the RTC impulse and the dark trail behind the moving object is more pronounced which is unfortunate.



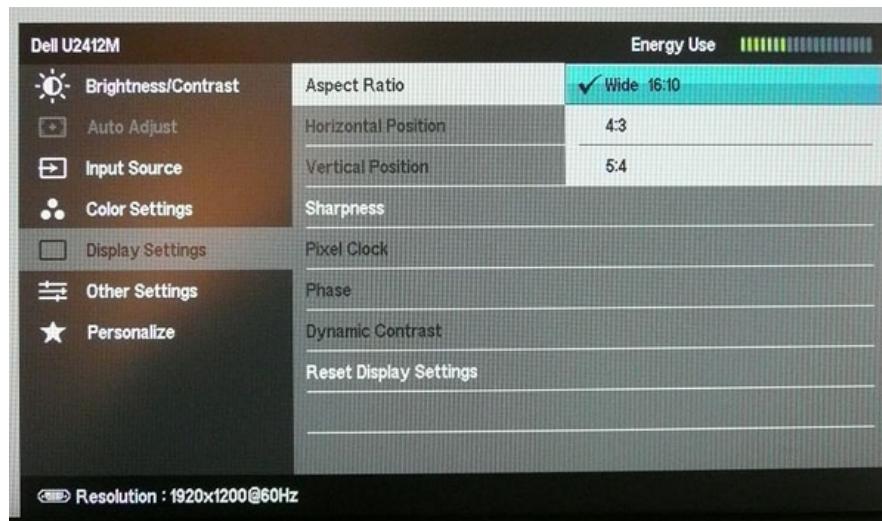
I have also provided a comparison of the U2412M against other competing 23" - 24" IPS models here outside of Dell's own range. The U2412M offers the least motion blur out of these 4 models shown, and certainly a marked improvement over the fairly slow Samsung F2380, and frankly quite disappointing BenQ EW2420. The HP ZR24W is a reasonable performer with only minimal motion blur and no overshoot. It is not quite as responsive as the U2412M which performs very well in this sector.



I've also included a comparison above against two gamer-orientated screens, both featuring heavily overdriven TN Film panels, and 120Hz technology. The pixel responsiveness of both of these is ahead of the U2412M, and the 120Hz frequency allows for improved 120fps frame rates and the support of 3D content as well. The BenQ XL2410T does show some even more obvious RTC overshoot in the form of very dark trails behind the moving image (speech bubble and head) which is unfortunate, and a sign that the RTC impulse is too aggressive. The Samsung 2233RZ remains our champion in this test.

The responsiveness of the U2412M should be perfectly fine for some most moderate to high gaming and shows a nice low level of motion blur assuming you leave the OD control turned on. The small overshoot is a shame really as the dark trail is an unwanted result of the applied RTC impulse. Having said that, it isn't as bad as some other models we have seen including Dell's own U2711 and certainly the gamer orientated BenQ XL2410T. There's not much in it when comparing the pixel responsiveness of the U2410 and U2412M but the newer model perhaps has the slight edge I think.

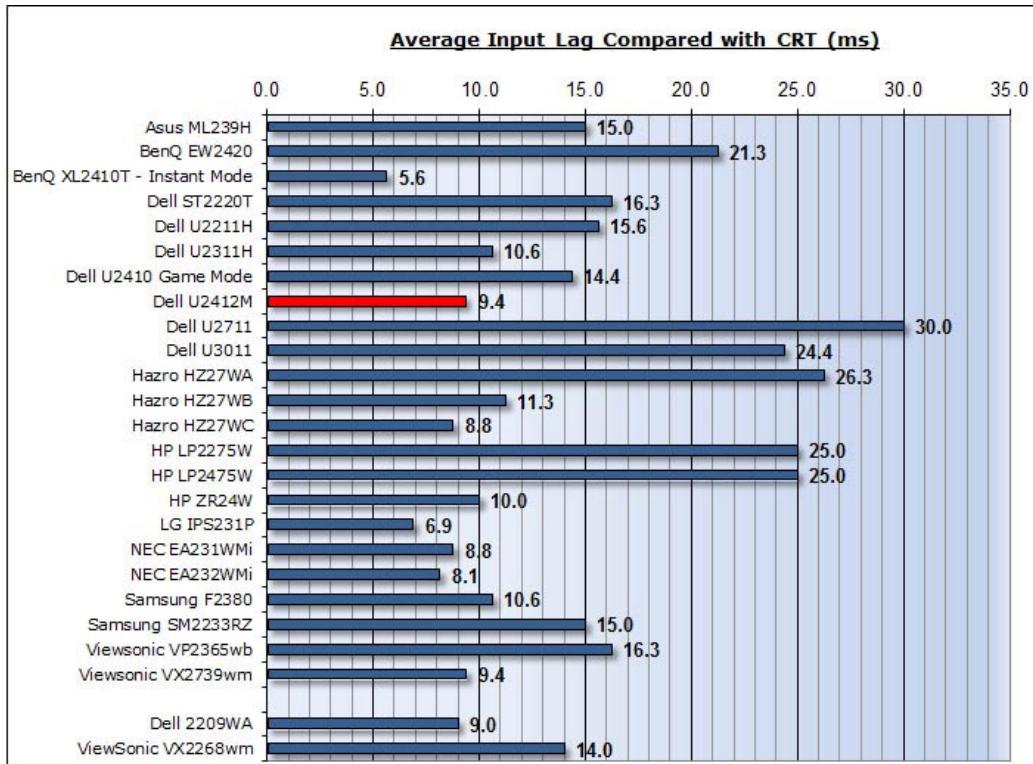
#### Additional Gaming Features



**Aspect Ratio Control** - The U2412M supports aspect ratio control options through the OSD 'display settings' menu as shown above. There are options for wide 16:10, 4:3 and 5:4 aspect here. A defined 1:1 pixel mapping mode is lacking here. With these settings there is also no option to automatically detect and maintain the source aspect ratio which is often very useful when using external devices. There is also no 16:9 aspect ratio option and so if you input a 16:9 source, the screen cannot maintain that aspect ratio at the hardware level, and so will stretch it to one of the other selected modes. This probably isn't a major issue for a PC where the graphics card is likely to be able to control the aspect ratio as well, but certainly something to be aware of when inputting an external DVD player or similar which is running at a 16:9 aspect.

**Preset Modes** - There is a 'game' preset mode available in the menu if you want it. We have tested the screen and found the colour temperature remains similar to the 'standard' mode at ~6500k. The dynamic contrast ratio is available in the game preset whereas it is not in the standard mode, although we have already seen that this does nothing in real use unfortunately.

#### Input Lag



As usual I tested the screen in clone mode with a CRT to determine the level of [input lag](#). This is something which can put off some gamers and is a delay between graphics card and monitor output. By hooking up a CRT you can show that the LCD lags behind somewhat, which can affect users in some situations where they rely on the screen image being as fast as their inputs (e.g. fast FPS shooting games). Often, input lag is very low and probably wouldn't represent too much of a problem in real terms.

The input lag of the U2412M was very low with an average of only 9.4ms and a maximum of 20ms. This was a very good result and was even lower than the U2410 when using its 'game mode' to bypass a lot of the internal electronics (14.4ms). It was also ever so slightly better than the U2311H (10.6ms). A good performance and no issue for gaming from a lag point of view.

## Movies and Video



The following summarises the screens performance in video applications:

- 24" screen size makes it a reasonable option for an all-in-one multimedia screen, although quite a bit smaller than modern LCD TV's of course
- 16:10 aspect ratio is not quite as well suited to videos as a 16:9 format screen, leaving larger borders on DVD's and wide screen content
- 1920 x 1200 resolution can support true 1080 HD resolution content
- Digital interface DVI supports HDCP for any encrypted and protected content
- Additional DisplayPort interface is available although it would have been useful to feature HDMI as well here as it is popular and very useful for external Blu-ray / DVD player connectivity.
- Black depth and contrast ratio are excellent for an IPS panel. Detail in darker scenes and shadow detail should not be lost due to these measurements.
- Dynamic contrast ratio is available but does nothing in practice unfortunately.
- 'Movie' preset mode is available from the preset menu. This made the image a bit cooler than the standard mode and provided access to the DCR mode (which as we've said, does nothing).
- Good pixel responsiveness which should be able to handle fast moving scenes in movies without issue.
- Wide viewing angles thanks to e-IPS panel technology meaning several people could view the screen at once comfortable and from a whole host of different angles.
- Very good ergonomic adjustments available from the stand allowing you to obtain a comfortable position for movie viewing.
- No noticeable backlight leakage from the panel which was pleasing. Thankfully no leakage along any of the edges which has the potential to become distracting when watching movies, especially where black borders are present.
- No integrated stereo speakers on this model but it is compatible with Dell's sound bar for some light sounds if needed.

- No picture in picture (PiP) or picture by picture (PbP) modes available on this model.

## Dell U2410 Comparison

I know many people are going to be asking the question: "which is better, the U2410 or U2412M?" I'd like to start by re-iterating the point that the U2412M is not replacing the U2410, but rather will be a supplementary model in the UltraSharp range, aimed more at the mass consumer market and multimedia user. The U2410 is aimed more at professional graphics users and higher end work while also offering an all round feature and function set. The price point is lower on the U2412M than the U2410 but its features do vary.

If I were to answer the question, I'd probably have to respond with "*it really depends on your uses, as the screens are quite different*". As a start here is a summary of the main differences between the models. I won't compare the various specs as they are not really relevant in practice and I'll look instead at the performance comparison based on our tests:



[Dell U2410 vs. U2412M Comparison](#)

	U2410	U2412M
Interfaces	Has HDMI, component and composite in addition to DVI, D-sub and DisplayPort	Missing - only DVI, D-sub and DP available
Controls	Touch sensitive	Standard buttons
Features	9-in-1 card reader and 4x USB 2.0 hub	Missing Card reader. USB present
Panel	LG.Display LM240WU4-SLB1	LG.Display LM240WU8-SLA2
Panel Colour Depth	8-bit + A-FRC (10-bit) 1.07 billion colours	6-bit + A-FRC (simulated 8-bit) 16.7 million colours
Internal Processing	12-bit	8-bit standard
Backlight	7x CCFL	W-LED
Colour Space	Wide gamut (102% NTSC)	Standard Gamut / sRGB (71% NTSC)
Emulation Modes	sRGB and Adobe RGB	n/a
Factory Calibration	sRGB and Adobe RGB modes	none
Design	Square edges and thicker profile	Slightly rounded edges and thinner profile
Provided Accessories	DVI, DisplayPort, D-sub cables and factory calibration report	DVI and D-sub cables only

### Colour Space

One of the main differences between these two models is the colour space support. The U2410 uses wide gamut CCFL backlighting which offers an extended gamut covering 102% of the NTSC colour space. This can also cover the Adobe RGB reference space as a result and extends considerably beyond the sRGB reference which is still widely used. The support of wide gamut is great if you have a practical use for it and are working with wide gamut content. However, if you are working just with sRGB content, viewing it on a wide gamut screen can lead to issues of over-saturation and neon appearing colours. Thankfully the U2410 does include a rather decent sRGB emulation mode which is useful in those circumstances.

The U2412M on the other hand uses modern white-LED backlighting which can only cover approximately the sRGB reference colour space and in fact is a little short at 95.8%. It would be referred to as a standard gamut screen. This is therefore easy and practical if you are just working with standard gamut content, but obviously of no use if you need to work in a wider colour space as it cannot support it at all. For graphics and professional colour critical work the below 100% sRGB coverage may also be an issue.

The U2410 also came factory calibrated to ensure a decent gamma and colour accuracy out of the box in both the Adobe RGB and sRGB emulation modes. This worked to a reasonable degree from our tests. The U2412M does not have any factory calibration and so its out of the box settings are a little more variable. Calibration should really be considered to correct the gamma and colour accuracy. White point is at least accurate to the 6500k target though which is good.

The U2410 is perhaps more useful to colour enthusiasts, photographers and designers thanks to its wide gamut support, but for the general consumer, most will not need to use wide gamut and will only be concerned with the appearance of standard gamut (sRGB) content. As such they would not want the over-saturated colours and issues associated with trying to manage standard gamut on a wide gamut screen, and so a W-LED based model like the U2412M is more readily accessible to the average user.

### Colour Depth

I'll also make reference to the fact that the U2410 features an 8-bit + A-FRC panel which can offer a colour palette of 1.07 billion colours if you have a relevant end to end 10-bit workflow (application, operating system, graphics card, interface etc). That is very rare and so to 99% of users this support of "10-bit" is largely irrelevant. It's 12-bit internal processing is designed to help improve gradients as well. These kind of features are usually reserved for high end graphics screens such as the NEC PA series, but Dell included them here on the U2410.

The U2412M goes the other way, instead reverting to a 6-bit + A-FRC e-IPS panel. This can support up to 16.7 million colours through the use of [Frame Rate Control](#). On paper this sounds vastly inferior, but to be honest most normal users would never notice any difference in practice between the two. The 6-bit + A-FRC of the U2412M is well implemented and gradients are actually very good with no visible banding. There is no obvious evidence of the FRC algorithm unless you look very closely for it. This cost cutting exercise is not a big issue and although some people may disregard the screen based on the spec, the mass market need not worry about it. Again for a more high end use the panel and internal processing of the U2410 would be more desirable.

### Features and Specs

The Dell U2410 is still available and retails for ~£425 GBP (inc VAT) in the UK. The new U2412M is a considerable bit cheaper at £290. The reason for the higher cost of the older model is really down to the additional features and extras it offers you. The 9-in-1 card reader, HDMI, composite input, component input, touch sensitive buttons, factory calibration and supplied DisplayPort cables have all been ditched on the newer model in favour of keeping production costs down. To me, the only things which I miss there are the HDMI input and card reader but I can appreciate the lower price point is a big positive.

### Performance

I've included a table summarising these screens side by side based on the testing we have carried out and on my opinions. The screens are colour marked as green (winner) or red (loser) in each category which should be self explanatory. Where I was not able to separate the two they are shown in grey. I will justify each result below:

	Dell U2410	Dell U2412M
Approx Price at time of writing	£425	£290
Features		
Interfaces		
sRGB Colour Support		
Extended Gamut Support		
Panel Uniformity		
Office and Windows		
Viewing Angles		
Movies Overall		
Responsiveness		
Input Lag (ms)	14.4	9.4
Colour Accuracy Default (dE)	6.7	3.2
Colour Accuracy Calibrated (dE)	0.2	0.3
Black Depth (cd/m <sup>2</sup> )	0.22	0.13
Static Contrast Ratio	541:1	947:1
DCR	1402:1	726:1

- **Approximate price** - U2412M is 47% cheaper than the U2410 and so is more widely accessible as a result to the mass market
- **Features** - The U2410 wins here with its extra card reader, factory calibration etc as we've already covered above
- **Interfaces** - Again, the U2410 wins here as explained above thanks to its HDMI, composite and component inputs
- **sRGB colour support** - Being W-LED based the U2412M is a 'native' standard gamut screen and so its use with sRGB content is simpler than the U2410. It doesn't quite cover the full sRGB space though. The U2410 does have a decent sRGB emulation mode so this was close and I've marked them as even.
- **Extended gamut support** - The U2410 has a wide colour gamut, the U2412M does not
- **Panel Uniformity** - I have marked these two screens as level in this test. The U2410 had a better luminance uniformity but a little more backlight leakage.
- **Office and Windows** - There's very little to separate them all here so I've marked them as level.
- **Viewing angles** - only a minor separation here really, but there was a slightly more pronounced contrast shift vertically on the U2412M than the U2410.
- **Movies Overall** - Again I've had to mark them level. The U2410 does have more connections for external devices but the black depth and contrast ratio on the U2412M is better and there is less backlight leakage.
- **Responsiveness** - They are all very close really on the most part but I'd have to give the slight edge to the U2412M in practice. There is slightly less motion blur but a little overshoot as a result.
- **Input lag** - pretty close but the U2412M is slightly lower at 9.4ms average, compared with 14.4ms on the U2410 (game mode).
- **Colour accuracy Default** - Out of the box, the U2410 had a high average dE of 6.7 whereas the U2412M was much better at 3.2 dE.
- **Black depth** - The U2412M wins comfortably here with a much lower calibrated black depth of 0.13, compared with 0.22 of the U2410. A nice improvement made with this newer model.
- **Static Contrast Ratio** - as a static number of 947:1, the U2412M is the best in this test. The U2410 only managed 541:1 which is fairly low.
- **Dynamic Contrast Ratio** - The U2410 works a little bit up to 1402:1, whereas the U2412M doesn't work at all in real life use.

Overall there are some quite distinct differences between the two models. The U2412M is certainly more readily accessible to the general casual user with a lower price point, normal sRGB colour space and decent set of features and functions. Its price point should attract a lot of interest and the screen still maintains the 'feel' of a Dell UltraSharp screen. Performance is overall very good and in some areas it out-performs the U2410. The U2410 still has its place though, for those wanting a screen more for graphics work and colour critical applications but without wanting to go all out on a professional grade screen like an Eizo or NEC etc. People who want some of the extra bells and whistles and support of a wider colour space will still want to look at the older U2410 instead of the newer U2412M.



## Conclusion



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The U2412M was an impressive screen to work with overall I felt. I am pleased Dell have stuck with some of the features which have made the UltraSharp 24" models so popular over the years. They've kept a decent range of connection options, a great range of ergonomic adjustments and an attractive well-built design. I was a little bit sad to see the card reader and HDMI input gone however but the rest of the cut backs I didn't really miss. The retention of an IPS panel is positive and the switch to a W-LED backlight is an obvious step to keep up with current market trends. It's standard gamut colour space as a result is also probably more appropriate for the mass market and average user.

Performance was very good as well. Default set up was moderate but the screen performed well after calibration. There was no obvious issue with reverting to a 6-bit + A-FRC panel and black depth / contrast ratio were excellent and some of the best we've seen from an IPS panel to date. As we've seen too many times, the dynamic contrast ratio was pretty useless but not something we'd miss too much. Uniformity of luminance was mediocre but from our sample there was no backlight leakage which was pleasing. Responsiveness was good and input lag was very low making this a good choice for gamers, multimedia users and those wanting a screen capable of handling a wide range of uses.

The price point of the new screen is also very attractive at ~£290 GBP (inc VAT). This makes it much cheaper than the U2410 (£425) and very competitively placed compared with some other popular 24" IPS models like the HP ZR24W (~£320) and HP LP2475W (~£420). If you looking for a good all round screen then this would be a great choice, and in my opinion makes another great addition to Dell's monitor range.

Pros	Cons
Very competitive price point	Some missing features like card reader and HDMI compared with the older models
Excellent black depth and contrast ratio	Dynamic contrast ratio does not work in practice
Good pixel responsiveness and low input lag	Some luminance uniformity issues



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