

QUESTIONS ON PROJECTORS, RESOLUTION, COLOUR SPACE, GRAPHICS CARDS ETC.

Further to several enquiries this is an update to the document 'Notes on Projectors and Laptops... Nov 15'. In addition to this document please see the following which may help further -

New Standard Resolution 1600px by 1200px from 1 Jan 2017

An insight into Resolutions

Notes on Projectors and Laptops for New 1600x1200 size Nov 15

available from <https://www.scottish-photographic-federation.org/competitions-guidance>

Q 1 - Our Club is planning to buy a new projector and we were wondering if there are any plans to update the "New Standard SPF Resolution 1600x1200 from 1st Jan 17".

A - The SPF do keep abreast of current technologies, and we have had recent discussions, but I can confirm that neither the SPF nor the PAGB are considering any plans to update our current standard resolutions of 1600x1200 (4:3 on a 1920x1200 projector). And, at this time it is not yet clear what the next resolution step would be, whether that would be 4K or an interim step.

Currently it is not practical or achievable cost wise for most clubs to go larger than this resolution, and still maintain the quality, as prices are still very high for projectors of our current quality. (Many cheaper 4K projectors aren't actually 4K, they are interpolated up to 4K meaning you aren't seeing the true pixels of the original image. For true 4K projectors you would have to spend over £5,000 at this time).

Other issues come in to play with larger file sizes such as file transfers, website uploads and storage costs, together with increased costs of Laptops capable of running the larger resolutions required (4K requires faster transfer speeds for video cabling particularly over a longer distance), and any graphics card/software requirements (e.g., cloned/mirrored screens).

Also, bear in mind that most Judges will not be able to accommodate viewing your images at 1:1 (100%) pixel size for resolutions any bigger than 1920x1200 (or possibly at 2560 x 1440 QHD), certainly not many will be able to view on 4K for some time, if they also want to achieve 99% or 100% AdobeRGB quality for their own workflow (i.e., for printing). Also remember that the whole AV system requires to be 4K compliant including laptop, cabling, and splitters etc. to achieve true 4K.

Q 1B – But 4K projectors are widely available now, aren't they?

A - 4K TV's widely available now have a panel native resolution of 3840 x 2160 pixels, however, most affordable projectors do not have a true native resolution of 3840 x 2160, they achieve 4K by using technology called "pixel shifting". It essentially manufactures the extra pixels, some shifting as much as four times, so doesn't give a true 1:1 pixel projection as the author intended, only true 4K projectors do, and they are currently very expensive.

Q 2 - sRGB is an SPF standard - Are there any thoughts on changing that to perhaps increase the colour gamut?

A – At this time there is no obvious standard colour space to make a clear move to from sRGB. The previous projector the SPF used was capable of AdobeRGB, but that is the last projector we are aware of that did. Many may think of AdobeRGB or ProPhoto that we are familiar with in our Cameras or within Photoshop etc., but projector technologies tend to work with different colour spaces being quoted (or even set as custom settings). Since DCI-P3 was developed for the digital medium, it has seen much wider adoption than AdobeRGB. Almost every single device type, from televisions to smartphones, now aims for at least some coverage of this DCI-P3 color space so this, in time, may become the new 'standard'. See more below.

Rec. 709 - used predominantly for TVs and projectors that offer 1080p video. However, images mastered to Rec. 709 are limited to 8-bit colour.

Rec. 709 and sRGB have the same basic properties but have different transfer functions. This is still the standard for many input devices, like cameras and scanners, as well as many monitors, laptop screens and smartphones. When looking for a projector, lookout for the Rec. 709 although authors will still be working to producing images as sRGB.

Rec.2020 is better than **709**. This is the colour standard used in 4K UHD video. It covers two resolutions, 3840x2160 (4K) and 7680x4320 (8K). Rec.2020 produces better colour than Rec.709 and has 10 or 12-bit colour information. It covers 75% of the visible spectrum. Rec2020 is a larger colour space near to the ProPhoto. **Rec 2100** adds support for high dynamic range e.g., HDR10.

DCi-P3 is used as the industry standard for cinema display production, because of its white point optimized for cinema projectors, and because its luminance is so low – perfect for projection in a dark room, which would perhaps suit our needs best. Some manufacturers refer to a percentage of the full DCi-P3 colour reproduction as a selling point. It supports HDR and 10 bit. It also has 26% more colour space than sRGB. It is close to AdobeRGB color space. **NB - DCi-P3 is not the same as Apple's Display-P3 or image-P3 in Photoshop.**

Q 3 - In your 2017 document you recommended a Radeon graphics card for a laptop because it allowed setting of the projector resolution separate to the laptop screen and allowed the projector to be set as primary display. Is this still the case? What issues have you had with other graphics cards that we could perhaps check out before making a final decision?

A – Most graphics cards now are set up by the laptop manufacturers, so there is no clear-cut graphics card make that is guaranteed to give you the control that you require. If you require mirrored/cloned display and the 1920x1200 resolution, then the only sure way to achieve that is to buy a laptop whose screen does that resolution or better.

A variety of makes of Laptop graphics cards allow you to set the resolution of your primary display, however some will not allow you to make the Projector the Primary device, the primary device stays with the laptop. On Windows machines the 'Primary device' is the only one running a profile, so this is important to gain accurate colour and correct calibration while running a laptop screen and projector.

This also impacts on the resolution you can set particularly while mirroring or cloning your laptop screen. If you can't set your Projector to the Primary device, this will likely mean you won't be able to make your resolution higher than the resolution of your laptop screen e.g., if your laptop screen is only 1920x1080 then that will be the maximum you will be able to set your projector resolution to as well (not the required 1920x1200).

You could use extended desktop settings or switch to Projector only, to obtain the required resolution but these will not allow you to see the same image viewed on both the laptop screen and the projected one.

Bear in mind to run a laptop display and a projector display at 4K will require a higher quality graphics card, so check out if your graphics card will run dual displays at this resolution.

Q 4 - Do you have a preference for ports/connectors (DisplayPort, Thunderbolt, HDMI, USB) for linking to the HDMI port of the projector?

A – For the Canon WUX500 projector, there is more flexibility of settings if you connect to the projector using a DVI-D projector as Canon give more menu choices using DVI-D than with HDMI. So, I would advise checking out the projector manual first before deciding on the best connection at that end.

Before deciding on the laptop end, consider the following –

If using a long cable or using a higher than 1920x1200 resolution (e.g., 4K) then you require faster connectivity – Thunderbolt or USB3-C, or DisplayPort 1.4 and if using HDMI, you need to ensure both your laptop port and cable are up to your display's requirements i.e.

Basic 4K - less than 10-bit colour, = **10.2Gbps.**

Advanced 4K - 10-bit colour or higher and HDR = **18Gbps** (i.e., HDMI 2.0 up to 5 metres)

This also requires you to purchase a cable suitable for this speed and remember any adaptors should also be compatible with the higher speed requirement. If you don't, then your display at worst, just won't work, or it will limit the resolution you can obtain.

As the SPF use a 7 metre long 'gold standard' cable we favour USB3-C at one end and DVI-D at the other currently.