



THE INTERNATIONAL TV CHANNEL
FOR FILM AND TV PRODUCTION

Damned lies and pixels

Geoff Boyle looks at the plethora of formats and subformats that make up the high definition family, and tries to obtain some meaning out of the often obscurantist spec sheets.

Article first published: March/April 2007

Time for a New Year's rant. It's not aimed at anyone in particular – I know there are bound to be people out there who assume it's aimed at them, but it's not. Anyway, I think there are still a lot of people who are confused about what SD is, what HD is, what 2K and 4K are. I also think that a lot of people with vested interests are very happy about the confusion. Until recently we had very clear definitions and ideas about what a picture is. If it's SD it's 720x576 pixels, using 4:2:2 subsampling in most cases. If it's going to produce something that can be called a broadcast picture, then it uses three chips, RGB, each one generating 720x576.

If we go to HD, then it's either 1280x720 or 1920x1080, but now we add interlace or non-interlace options. It's still probably 4:2:2 color subsampling, but there are systems in general use capable of full 4:4:4 sampling, which is desirable if you have a lot of VFX or you want to do severe color correction.

So far so good, but now some manufacturers start to, er... 'cheat' is the word I'm tempted to use, but let's just say that they get a little overoptimistic. They originate 1440x1080 (instead of 1920x1080) or 960x720 (instead of 1280x720), and using the wonder of algorithms magically generate the missing 25 per cent. Is this as good as starting with 100 per cent? No, but at least we still have 100 per cent RGB from three chips, don't we? Well, not always.

Then the world shifts on its axis and we start to get single-chip cameras at all kinds of suggested resolutions. Single-chip cameras use a Bayer pattern, something invented by Kodak 25 years ago. This makes up its picture from a mosaic of pixels, one line RGRGRGRG, the next GBGBGBGB. So let's take a theoretical 1920x1080 Bayer pattern sensor. Unlike a three-chip camera, where you have 1920x1080 of red, green and blue pixels, here you have 960x1080 of green, and only 960x540 of red and blue! Of course the manufacturers will tell you that they have algorithms that extract extra data and manage to create the missing information from thin air (as well as pixel-shifting). Anyone interested in buying London Bridge? In fact, it's not quite as bad as I've stated above. The math does extract some extra info, and I'd be happy to describe the camera as 1440x1080 4:2:2. This is, of course, a purely theoretical camera I'm talking about here. And remember it's not just single-chip Bayer pattern cameras that play games with the math: a lot of three-chip cameras do. The Sony F900 originates in 1440x1080 rather than 1920x1080, while other cameras use pixel-shifting in two directions to get a 1080 signal from 540x960 pixel chips. So what would I be looking for now if I were in the market for a single-chip camera? If I wanted pictures roughly in the same class as a Sony F900 – maybe even a bit better – I'd be looking at 2K Bayer cameras. If I wanted 2K, I'd look at 3K cameras. Of course if I could get more...

Assessing cameras

A word of warning when it comes to assessing new cameras with their often individual chip specs: don't just look at the pixel count, look at how many of those pixels it actually uses in the mode that you want. If you want 2K out of a 4K camera, for instance, you can either scan a 4K chip at 4K and interpolate down to 2K, or else you can scan a 2K section of the chip. These will lead to very different results, so you should always aim to originate at the highest pixel count you can. I guess that I should now talk about compression. Not long ago, I wouldn't have thought of using a compression system that used a higher compression ratio than about 2.5:1. Since using wavelet compression systems, as found in the Silicon Imaging and Red cameras, I've changed my mind and am happy with 5:1.

Size does matter: the more data you have per frame the more you can do with it. It's easy to interpolate downwards and bloody hard to do it upwards. What you're never told when you read stories about low pixel count/high compression cameras being used for major features is how many million pounds it cost to fix in post.

Things are evolving rapidly, and I personally hope for a movie version of a Foveon chip. This has separate layers for each color, just like film, so a single 2K Foveon chip will give you 1920x1080 RGB with a 'safe' area.

So how do you decide which camera is right for you? Well, whatever you read, you should test, test, test. Try over/underexposing, different colored light, strange combinations of moving objects (to test compression), and finely detailed test charts to assess aliasing and resolution. When you've fed your tests through the entire post route you intend to take, including the compression system that will be used for transmission, then – and only then – make your mind up. It's what you like the look of, and that your clients will pay for, that matters in the end.

You can start by looking at tests published here and on websites, such as www.cinematography.net/compare.htm. But the information on that site is just what I think is relevant in a test; it may not matter to you. There are other sites that will have different views and different results. It all comes down to you in the end: don't let yourself be bamboozled or be caught on the current tide of hype.



Geoff Boyle

Reel Show cinematography editor Geoff Boyle's recent feature films as director of photography include *The Mutant Chronicles*, *Dark Country* and, currently, *Street Fighter 2*. He received his first camera, a Brownie 127, when he was eight. From then on the future was clear. After art school in the late 60s, he worked as a

stills assistant. One day he was asked if he knew anyone who could film a concert. Of course he did! He moved into film and shot documentaries for TV, 10 years or so of 20/20 for ABC and a lot of music videos. In 1985 he shot a 'making of' about the Pirelli calendar. Terence Donovan liked the way he lit and asked him if he shot commercials. From 1990 to 2005, he has shot almost entirely commercials, with occasional sidetrips into drama, a short he shot – About A Girl – winning a BAFTA in 2001. He also shot special effects on Enemy at the Gates, won the SMPTE Eastman Gold medal in 2000 and was made a fellow of the BKSTS that year. He started the cinematography mailing list (CML) in 1996 with 60 members. It now has over 3,000 members in 148 countries and is acknowledged as the pre-eminent internet site for cinematography.