



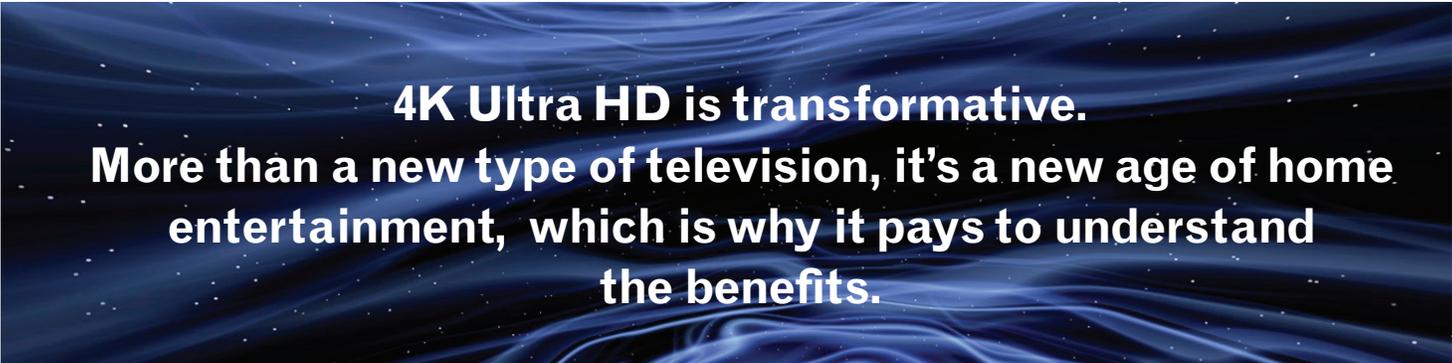
Understanding the 4K Ultra HD Experience

Nearly 20 years ago, High Definition (HD) changed the face of home entertainment, ushering in a new era in picture and sound. Since that time, two decades of advances in cameras, recorders, encoders, monitors and projectors have enabled the creative community to produce content that far surpasses anything conventional HDTVs can display. To bring home everything that today's entertainment can deliver, we need television to be substantially more vivid, more immersive and more lifelike than HD. This is the 4K Ultra HD experience.

Consumers will be able to enjoy movies and TV shows with greater dramatic impact. Televised sports will bring viewers closer to the action than ever before. And videogames will deliver an even more powerful adrenaline rush.

You may have heard the term 4K Ultra HD used to describe televisions with 4K resolution. But as you'll see, resolution is just the first chapter of the complete 4K Ultra HD story. Amazing new creative tools – High Dynamic Range, Wide Color Gamut, High Frame Rates, 10-bit Encoding and Object-Based Audio – are giving producers, directors and cinematographers dramatic new storytelling possibilities.

While not every production will choose to take advantage of every available tool, 4K Ultra HD can deliver an unprecedented "wow factor" for motion pictures, concert videos, episodic television, live sports, videogames and even your home movies.



**4K Ultra HD is transformative.
More than a new type of television, it's a new age of home
entertainment, which is why it pays to understand
the benefits.**

Just as High Definition was an important step in quality over the Standard Definition era, nothing in the HD universe compares to 4K Ultra HD. Consumers will soon enjoy movies, concert videos, TV dramas, live sports, videogames and even their own personal content as never before. And this also creates an incredible opportunity for all of the industries in the 4K Ultra HD ecosystem. The 4K UltraHD experience changes everything.

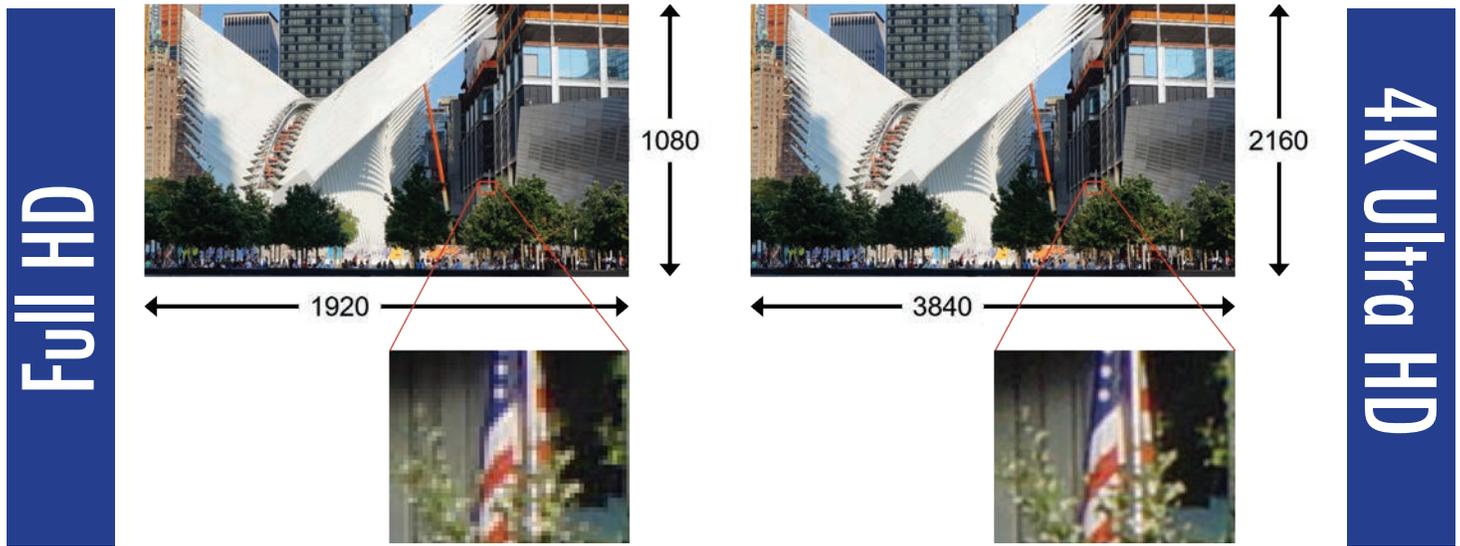


The 4K Ultra

MORE DETAIL

The foundation of 4K Ultra HD is higher resolution – 4 times the picture elements (pixels) of Full HD. The term “4K” describes a picture that’s roughly 4000 pixels across: 3840 x 2160 versus conventional HD’s 1920 x 1080. 4K is already well established in the Hollywood production community, where 4K cameras are now commonplace. It’s also successful in the home, accounting for a growing number of screens 55” diagonal and up.

4K is best appreciated when viewers sit up close to the screen, becoming more involved in the action yet still not seeing visible pixels or “jaggies” on image diagonals. The detail is positively mind-blowing.



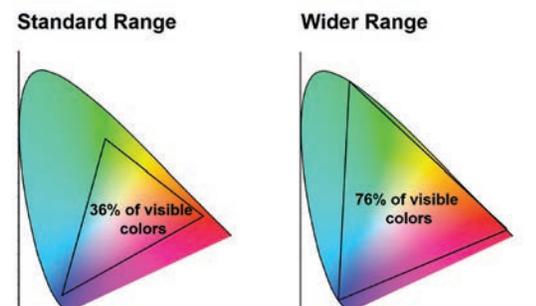
BETTER MOTION

Motion pictures don't actually move; they're created by a rapid sequence of still pictures (frames). Lower frame rates, such as 24 frames per second (fps) can sometimes cause motion blur and coarse motion artifacts or “judder.” While live HD broadcasts support up to 60 fps, 4K Ultra HD gives content producers the option to use frame rates as high as 120 fps. You get amazingly sharp images and fluid motion that is particularly well suited to fast-action sports and videogames.



MORE COLORS

Another creative option is a wider range or “gamut” of available colors. HD can only reproduce about 36% of the colors visible to the eye. This means there are many hues in everyday life that are beyond the reach of HD televisions, especially among the reds, yellows, and greens. Fortunately, 4K Ultra HD makes it possible to show nearly 76% of all the visible colors. This enables directors and cinematographers to create even more amazing pictures – and enables consumers to enjoy those pictures to the fullest at home.



HD Experience



Less texture
Duller highlights with fewer shades of yellow.
Fewer leaves visible



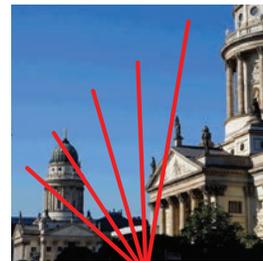
Richer texture
far brighter highlights with more shades of yellow.
More leaves visible

BETTER CONTRAST

While resolution is the foundation of 4K Ultra HD, the system also offers an enticing range of other creative options that productions can utilize. For example, a new technology called High Dynamic Range (HDR) creates picture vibrancy never before seen on a television screen. HDR makes it possible to reproduce a far greater range of real-world contrast from deepest blacks to brightest highlights. Conventional consumer Standard Dynamic Range (SDR) televisions vary between 100 to 400 “nits” of maximum brightness, while HDR can measure up to ten times that amount! HDR also reveals hidden detail and shades of color in the highlight areas, plus more detail in the shadows. It’s simply breathtaking.

SMOOTHER COLOR

Another significant creative option is smoother color transitions or “gradations.” Conventional HD means 8-bit encoding: about 250 levels per color. This can leave visible stairsteps or “banding” in what should be gradual color changes across broad areas like the sky. More bits mean finer gradations. That’s why digital production is increasingly performed at 10, 12 or even 16-bit encoding. 4K Ultra HD enables consumers to enjoy 10-bit color or better, corresponding to 1000 levels per color or more! So viewers will see exceptionally smooth hues, especially important for content that includes wide color gamut and high dynamic range.



8 bits and higher: Uneven gradations

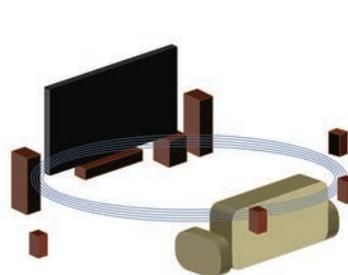


10 bits and higher: Smooth gradations

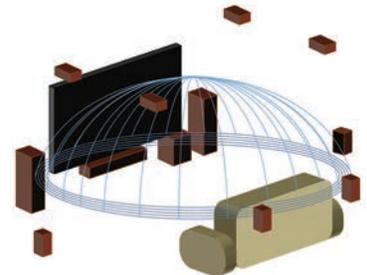
MORE IMMERSIVE SOUND

Conventional surround sound encoding arranges audio into a fixed number of channels which are played back in a circle of loudspeakers. While this can effectively position sound along the left/center/right and front/back dimensions, something critical has been missing: height. The latest object-based audio systems also place sound overhead, a decided advantage when the story calls for passing aircraft; ambient wind and rain or even bullets zinging by. You’ll enjoy a far more immersive, more involving, three-dimensional sound experience.

Channel-based Audio



Object-based Audio



4K Ultra HD as an Ecosystem

A paradigm shift as important as 4K Ultra HD must be more than the work of just one company – or even one industry. In fact, 4K Ultra HD is supported by many of the most prominent motion picture studios, television networks and music companies. Taken as a whole, these companies are expected to bring to market hundreds of 4K Ultra HD titles over a variety of platforms by the end of 2016.



LIONSGATE



4K Ultra HD also enjoys the support of many television and player brands.



Panasonic

PHILIPS

SAMSUNG

SHARP

SONY



VIZIO

4K Ultra HD is supported by major content distribution platforms.



All of this is made possible by international standards that cover everything from production and postproduction to distribution and presentation in the home. 4K Ultra HD has involved the active participation of many organizations in addition to the DEG.

- Advanced Television Systems Committee
- Blu-ray Disc Association
- Consumer Technology Association
- HDMI Licensing LLC
- International Telecommunication Union
- Society of Motion Picture and Television Engineers
- UHD Alliance



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