

Telairity Dives Deep Into 4K Technology – Part 2

Continuing the discussion of resolution standards for television displays we began in Part 1, the important point about digital bitmap formats like HD and UHD is that they fix the number of pixels a display has, independent of screen size. Every “full HD” screen is an array of 1920 x 1080 pixels, whether the screen measures 30” or 70” or some other number. Similarly, every UHD screen is an array of 3840 x 2160 pixels, regardless of how large or small the UHD screen.

Pixels Size and PPI

Obviously, with a fixed number of pixels—roughly, 2M in a 2x1 “2K” HD bitmap, 8M in a 4x2 “4K” UHD bitmap—what must happen as an HD or UHD screen gets larger or smaller is that the individual pixels in the array must grow or shrink in size accordingly. This brings us to yet another critical metric for displays, known as ppi or pixels-per-inch. Although an old idea (familiar to anyone who has ever bought a raster printer as dpi or dots-per-inch), this metric was first popularized for displays by Apple, with the term “retina display”, meaning a display where the pixels are too small to be individually distinguished by the human eye, even on close scrutiny. In ppi terms, pixels get too small to be seen (by all but the most eagle-eyed) somewhere just short of the number 300, so a “retina display” is any screen with a ppi number of 300 or greater.

The Importance of “Recommended Viewing Distance”

The notion of ppi, in turn, brings us to our final critical metric for this discussion, viewing distance. Even the largest pixels can be made too small to be individually distinguished by the human eye, by the simple expedient of moving the eye further away from the display. This is the principle behind “Jumbotron” displays, which have pixels the size of playing cards (or bigger), but are designed to be viewed from hundreds of feet away.

If TV screens were built to retina display standards, intended to withstand close scrutiny from a few inches away, they would be disappointingly small. An HD screen built to the “retina display” threshold of 300 ppi would be smaller than 7 x 4 inches (about the size of many current smartphone screens). Even an UHD “retina display” would be less than 13 x 8 inches.

The reason TV screens of 50” and more are common is simply that TVs are not designed for close up “retina display” viewing. As screens (pixels) are made bigger, the adjustment made by display manufacturers is simply to increase the recommended viewing distance (thereby maintaining a constant apparent pixel size in the eye of the viewer). Conversely, as screens (pixels) get smaller, viewers are allowed to gradually move closer, following recommended viewing distance guidelines, again with no change in the apparent pixel size.

It’s taken awhile, but we are now ready to explain the impact of the shift from HD to the new UHD resolution standard ... in the next part of this series.

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