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TV TechCheck

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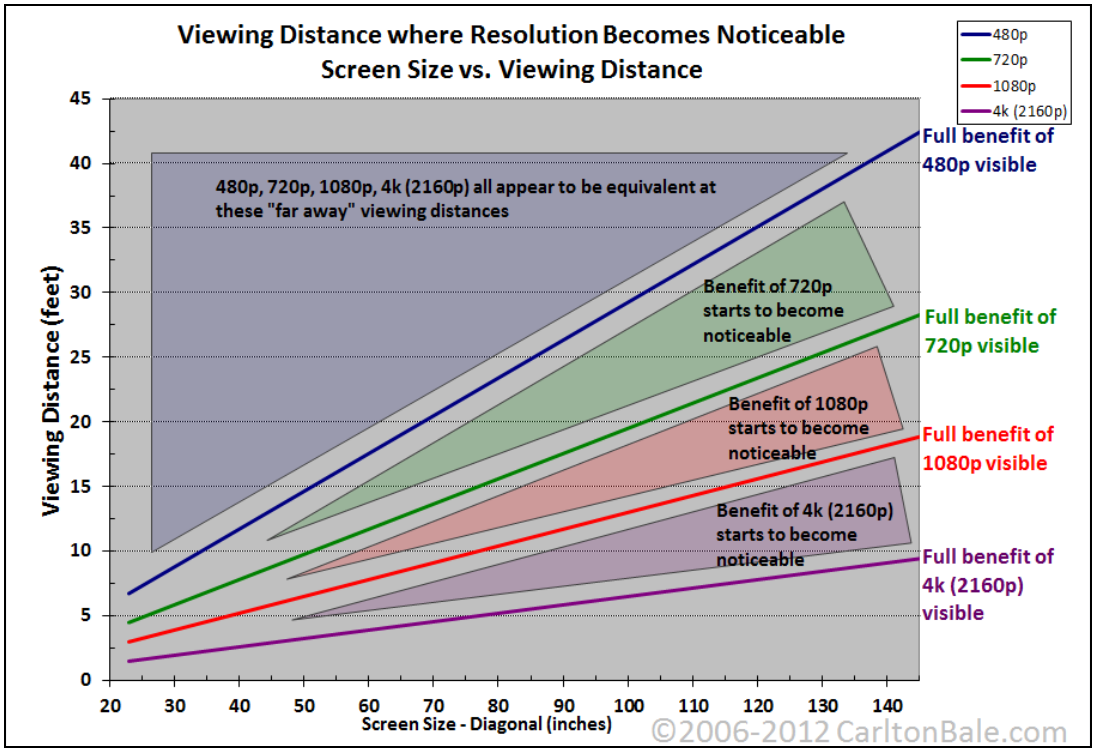
Higher Definition Television is On the Way

Years ago, the Consumer Electronics Show (CES) was held in both January and June. Since the late 1990's, it's just been a winter show, but for the past several years, in June, CEA hosts the CEA Line Shows in New York, where new consumer products can be featured mid-year. At this year's event, Westinghouse Digital showed its model D55QX1, a 55-inch consumer TV featuring "4K" resolution of 3,840 pixels (H) X 2,160 pixels (V), planned to be released in the first quarter of 2013. LG, Sharp and Toshiba had previously shown 4K TV sets at the 2012 CES. Toshiba's 55-inch 4K set was set to debut in Japan late in 2012 (at an expected price of $12,000) but it is not expected to be available in the U.S. until 2013. Nonetheless, 4K TV is clearly real and starting its introductory launch in the not-too-far future.

Industry interest in 4K is growing. In early June, the Consumer Electronics Association announced the formation of a 4K Working Group, to act as a forum for interested parties, including broadcasters, to define 4K technology, discuss content options and educate consumers about 4K. The first meeting of the main 4K Working Group was held in early July, and was well attended by a broad cross-section of the television industry. One of the subgroups, chaired by Bryan Burns, vice president of strategic business planning at ESPN, will be discussing content options and is interested in the views of broadcasters and others on business strategy and planning with respect to the opportunities in 4K TV. Their first meeting will be held by conference call on Thursday July 12. Those interested in participating in these discussions should contact Kinsey Fabrizio at CEA at kfabrizio@ce.org.

The benefits of the higher resolution of 4K (as with HDTV) are dependent on viewing distance and screen size. With 4K though, at typical viewing distances (such as the often quoted Lechner distance of 9 feet) the minimum screen size to appreciate the higher resolution starts to get rather large. Given normal 20/20 visual acuity, humans can resolve objects with a subtended angle as small as one arcminute (1/60th of a degree). Applying that criteria to screens with different sizes and pixel count resolutions can yield the relationship between maximum viewing distances for various sized screens. A nicely produced graphic showing these relationships is available at carltonbale.com and is reproduced below:



Note that the full benefit of 4K TV at the 9 foot Lechner distance would require a screen diagonal in excess of 140 inches, whereas for HDTV a screen diagonal of about 70" will suffice.

As it turns out, the subject of resolution, as a proxy for the subjective judgment of realness or sense of being there, is more complicated than can be depicted in a simple graph. For an in-depth treatment of the history of "high definition" and all the relevant factors in evaluating high resolution imagery, take a look at Mark Schubin's paper "Why 4K: Vision and Television" presented in May 2012 at the 2012 Spring Technical Forum of CableLabs-NCTA-SCTE.

4K source material exists now for consumers to view in movie theater settings, but getting 4K into to the home environment is just at the beginning stages. Version 1.4 of the HDMI specification includes support for 4K, and the Sony BDP-S790 Blu Ray player, at an MSRP of just over $200, will upscale HD content to 4K resolution. Broadcasters' thoughts, however, turn quickly to the challenges of transmission requirements. After all, 4K content has four times the number of pixels as HDTV, and the 19 MB/s data capacity available in the ATSC DTV Standard is clearly insufficient, given the limitations of MPEG-2 compression. But newer compression schemes may change that. In particular, High Efficiency Video Coding (HEVC), now in the final stages of standardization by the ITU-T \ ISO/IEC Joint Collaborative Team on Video Coding (JCT-VC), could be the compression engine that makes 4K transmission over-the-air feasible, at least technically. At the 2012 NAB Broadcast Engineering Conference, for example, Matthew Goldman from Ericsson presented a paper called "High Efficiency Video Coding: Next Generation Compression Technology Driving New Business Models for Television" in which he made the case that today's transmission system might be able to support 4K content with HEVC coding substituting for MPEG-2. Below is an excerpt from the paper authored by Goldman and Ericsson colleague Mark Horton:

> "Early HEVC tests have shown that original non-compressed 4K TV can be shown at 18 Mbps compressed and still show stunning results. This figure effectively means 4K TV could potentially be shown at bitrates currently used for MPEG-2 Video based HD services."

The full paper, along with several other papers referencing HEVC, is included in the 2012 NAB Broadcast Engineering Conference Proceedings, available from www.NABStore.com.

Terminology is also an issue in beyond-HDTV systems, especially as a potential confusion factor for consumers. On May 24, the International Telecommunications Union (ITU) announced completion of a new Recommendation on the technical details for Ultra High Definition Television or UHDTV. UHDTV as defined by the ITU includes two levels: a "4K" level of 3,840 pixels (H) X 2,160 pixels (V) (4 times HDTV) and an "8K" level of 7,680 pixels (H) X 4,320 pixels (V) (16 times HDTV). NHK has been developing and demonstrating the 8K system known as Super Hi-Vision for several years. Super Hi-Vision (SHV) is likely to get significant exposure this summer as some of the venues at the Summer Olympics will be captured in SHV and shown at public sites. While impressive in large venues, getting the full benefit of 8K images at the Lechner distance in a home environment may prove to be elusive however. Extrapolating the graph above to 8K resolution would limit the potential set of optimized homes to those with castle-size doors and 12 foot-plus ceilings—perhaps old Victorian homes will become all the rage with the next generation's videophile crowd!