

Seeing the Bigger Picture

A closer look at the technology, science, content, and business strategies behind the 8K viewing experience



Presented by the



Overview

Ask almost any video enthusiast to describe the current state-of-the-art in home entertainment and, chances are, their response will be “8K technology.”

Yet despite this enthusiasm, only a modest number of 8K televisions and projectors have been sold thus far due to a variety of factors, including the high price of these initial models. Additionally, as with any new entertainment platform, content is critical and just a limited amount of compelling content has been available.

Fortunately, this landscape is now rapidly changing, thanks to sales trends in large-screen televisions, shifts in consumer expectations, developments in content creation, and technology advances in fields as diverse as data processing, spatial imaging, and video compression. In this new environment, 8K is becoming a more compelling value proposition for anyone committed to producing, exhibiting, distributing and displaying the ultimate in video entertainment.

Delivering powerful advantages in immersion and “super realism,” 8K is now poised for substantial growth. This paper explains why.

Why 8K matters

Advantages over 4K

Some have argued that 4K resolution – composed of 3840 x 2160 picture elements (pixels) – completely satisfies entertainment delivery and that 8K (7680 x 4320) offers no additional benefits. But this argument is based upon two false assumptions.

The first assumption pertains to the concept of “*immersion*.” Many observers assume that viewers never want an experience more immersive than that of the middle seat of a conventional movie theater, which is the maximum that 4K can offer. In truth, many moviegoers purposely choose to sit in the rows closest to the screen. And all but the very last rows of IMAX large-format theaters are more immersive than the conventional middle seat, while the IMAX front rows deliver a powerful “wow” factor that’s far beyond the reach of 4K.

The second assumption involves something called “*super realism*.” The argument goes that so long as the pixels appear as small as the smallest distinct elements on an eye chart, the pixel grid will be invisible to the human eye, and the visual system will be completely satisfied, with no further improvements necessary. However, research on hyper-acuity disproves this. And lab tests of television viewing have repeatedly confirmed the benefits of a picture so detailed that viewing becomes less like watching television and more like seeing an object in real life. (For more information on these studies, see the section of this paper titled The Visible Benefits of 8K.)

In short, 4K forces big-screen enthusiasts to make a choice. You can either sit close to the screen to experience maximum immersion. Or sit further back to achieve super realism. You cannot have both at the same time. In contrast, 8K is the first home entertainment platform to combine the best of both worlds: powerful immersion together with the most realistic picture possible.

All of this makes 8K the ideal choice for discriminating videophiles and home theater enthusiasts. 8K is perfect for premium televisions, projectors and A/V receivers that deliver the ultimate entertainment experience.



8K delivers four times the pixels of 4K and sixteen times the pixels of Full HD.

8K is an international standard

8K is defined as “UHD-2” by the International Telecommunication Union’s landmark Recommendation ITU R-BT.2020¹ and the Society of Motion Picture and Television Engineers (SMPTE) suite of ST 2036 Standards.

The 8K standard is also supported by HDMI Licensing, LLC; the Video Electronics Standards Association (VESA), which establishes DisplayPort standards; the Consumer Technology Association; Digital Video Broadcasting (DVB); and NHK, the national broadcaster of Japan.

8K technology advances are changing the game

In their ongoing pursuit of greater immersion, consumers are purchasing bigger television screens and sitting closer than ever before. In fact, according to the latest data from Display Supply Chain Consultants,² 70 inch or larger screen sizes are now the *fastest growing* segment, with a sales increase of 28% versus last year. But without 8K resolution, buyers of the largest screens are not getting the full experience they seek.

Together with this trend in home entertainment, recent advances in 8K content creation – led by a new generation of cameras, encoders, processors and displays - have dramatically improved the production and practicality of native, computer generated, and upconverted 8K content. (For more information, see the section of this paper titled The 8K Content Ecosystem is maturing.)

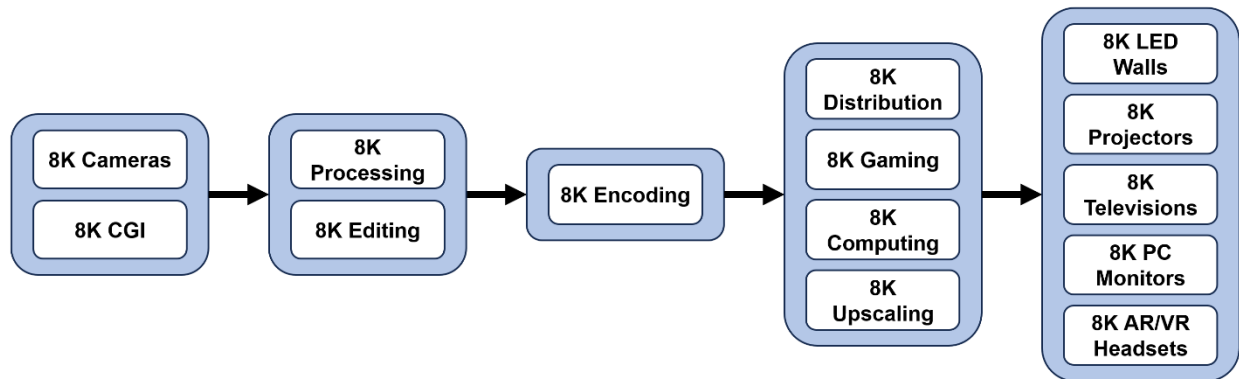
All of this gives 8K the potential to drive ultra-high-definition entertainment and media during the coming decade.

Consumer and retail channel perceptions are catching up to 8K

According to the Consumer Technology Association, nearly 1 out of 10 households reported they intend to purchase an 8K TV in the coming year.³ In addition, according to Display Supply Chain Consultants, 8K is poised to represent 6% of all TV sales by 2027.⁴ The key to meeting this future demand will be high-end specialty retailers and integrators, who have repeatedly led the way in driving new technology adoption. In fact, 8K has been acknowledged as the #1 emerging trend in 2024 for custom integration according to a recent article in *CE Pro*.⁵

The 8K Content Ecosystem is maturing

8K is now supported by a complete ecosystem. This extends from cameras to postproduction, PC processing, encoding, decoding, distribution, and displays. 8K also supports a wide range of consumer and industrial applications.



8K cameras

Cameras with 8K or higher resolution enable content creators to deliver tremendous visual impact. This starts with more compelling detail, particularly on wide shots and exterior day scenes. 8K cameras also deliver greater sharpness – the combination of contrast and resolution that matters most to human perception. And producers are taking advantage of 8K in virtual production: in-camera visual effects where talent and props are arranged against computer-generated backgrounds on LED displays.

8K cameras can capture and generate an extraordinary range of commercial and personal applications:

- Motion pictures
- Episodic television
- Live events
- Super-resolution zoom-in for slow-motion sports replays
- Online videos
- Visual effects
- Security/surveillance
- Remote capture via drones

8K cameras are not only extraordinarily capable, they're also gathering momentum. Cameras that meet – or exceed – 8K resolution are now being offered by many of the best-known professional brands. These include Blackmagic Design, Canon, DJI, Fujifilm, Nikon, Panasonic, Panavision, RED Digital Cinema, and Sony.

An early adopter of 8K technology was RED Digital Cinema, which was recently acquired by Nikon. According to Uday Mathur, chief product officer of RED, "We entered into 8K very early and it was always something we had to convince customers of."

Now with the emergence of 8K screens, it's not a large leap to think that 8K will become pervasive within a few years."⁶

Moreover, Abdul Rehman, the Chief Product Officer at IMAX Corporation, states, "We firmly believe that shooting content in 8K is essential in today's landscape for capturing creative intent with high fidelity. While our IMAX film cameras offer the highest fidelity, IMAX-certified digital cameras are capable of shooting in 8K and deliver exceptional resolution and quality."⁷

Additionally, two-time SOC Camera Operator of the Year, Bob Gorelick says, "As a motion picture and television camera operator, I believe that 8K can be extremely beneficial to live events/sports, visual effects, postproduction, drone photography and scripted content. Consumers seem to have an insatiable desire for larger and larger televisions in their homes and 8K can deliver the highest quality production value to these audiences."⁸

8K editing & postproduction

All of this 8K content is being edited and mastered on a growing number of applications, systems, and workstations including Adobe Premiere Pro, Apple Final Cut Pro, Avid Media Composer, and DaVinci Resolve.

Even when content is distributed at lower resolution, 8K production provides valuable benefits. "Super sampling" at 8K means more perceived sharpness and higher-contrast detail, right up to the resolution limit of the release format. 8K also enables image stabilization and reframing when zooming and panning in post-production.

8K encoding & decoding

With four times the pixels of 4K, 8K has until recently been a challenge for conventional data compression schemes and conventional streaming services. However, established compression technologies like H.265 are now being joined by new codecs like VVC (Versatile Video Coding), making 8K delivery more efficient. 8K is also supported by major SoC (System-on-a-Chip) companies MediaTek and Novatek, who supply key components for televisions.

In addition, 8K encoding and decoding is available from digital technology leaders including Atime, Fraunhofer, Harmonic, Intel, Main Concept, and Spin Digital. As Spin Digital CEO and co-founder Mauricio Alvarez-Mesa explains, "Not only are we using a next-generation codec, VVC, for 8K, but we're also bringing visual science into the game. We're getting even higher performance by adding perceptual coding and content-aware encoding."⁹

These and other new technologies can deliver 8K to the home at data rates on par with today's 4K services (<40 Mbps). While earlier 8K compression required super high-speed connectivity (>1 Gbps), today's technologies will soon make 8K streaming direct to the home feasible using conventional Internet bandwidth (<250 Mbps).

8K processing

The new video codec technologies also work well on the latest CPUs and GPUs from leaders like Apple, AMD, Intel, and NVIDIA, to help make 8K processing much easier. These scalable devices can be found in a growing number of computers that support 8K, including select Apple MacBook Pro models, and various PCs from Asus, Dell, HP, and Lenovo.

8K distribution

Consumers today are clamoring for larger, more immersive viewing experiences across every entertainment platform. For example, in movie theaters, both audience excitement and revenue growth are transitioning to premium large format venues like IMAX. Moreover, Abdul Rehman of IMAX says, “IMAX Streaming and Consumer Technology enables measuring and optimizing the viewer experience for 8K content, tailored to target display devices. As a result, our solutions enable our streaming partners to deliver a distinct and superior viewer experience.”¹⁰

8K can also deliver live sports. Intel initially demonstrated 8K streaming with High Dynamic Range at 60 fps over the Internet during the Tokyo 2020 Olympics. Intel also plans to use their latest Xeon processors to stream the Paris 2024 Olympics in 8K. Ravi Velhal, Director of Technology and Standards for Intel Research, states, “Realtime 8K/60 fps/HDR is an ultimate speed test. Our Intel scalable Xeon processor using AI accelerator encodes the live signal from 48 gigabits per second raw feed to a 40-60 megabits per second broadcast grade distribution signal in VVC in less than 200-400 milliseconds.”¹¹

In addition to live sports, late last year NHK streamed a live concert in 8K at 60 fps, complete with 22.2 channels of immersive audio.¹²

And YouTube currently streams native 8K content on a number of their channels, with hundreds of thousands of subscribers. Some of these videos have racked up millions of views.

Finally, 8K is also becoming a standard for PC-based gaming and is supported by both Windows and MacOS computers. According to NVIDIA,¹³ PC games that feature 8K include some of the most popular titles:

- *Apex Legends*
- *Battlefield 1*
- *Black Desert Online Remastered*
- *Control*
- *Death Stranding*
- *Destiny 2*
- *Doom Eternal*
- *The Elder Scrolls Online*
- *Euro Truck Simulator 2*
- *Final Fantasy XIV: A Realm Reborn*
- *Forza Horizon 4*
- *Genshin Impact*
- *Grand Theft Auto V*
- *Left 4 Dead 2*
- *Overwatch*
- *Rainbow Six Siege*
- *Risk of Rain 2*
- *Rocket League*
- *Sea of Thieves*
- *Smite*
- *Titanfall 2*
- *Valorant*
- *War Thunder*
- *Warframe*
- *Wolfenstein Youngblood*
- *World of Tanks*
- *World of Warcraft*
- *World of Warcraft Classic*

8K televisions and projectors

The ongoing quest for larger, more impressive screens is also driving the trend toward 8K televisions, which tend to be top-of-the-line models. 8K flat panel TVs are currently available from Hisense, LG, Samsung, Sharp, Sony, and TCL.

What's more, 8K home theater projectors are offered by Digital Projection, Hisense, JVC, and Samsung. And Sony recently announced the development of a new LCOS-based projector panel with native 8K resolution.¹⁴

In addition to displaying native 8K content, 8K televisions can upconvert HD and 4K content. The latest 8K scalars utilize AI technology to analyze contrast, color, and noise, and cross-reference image databases for more realistic results. These algorithms can achieve quality that impresses even the most demanding viewers.

A variety of other business and personal applications are also supported by 8K cameras, displays and devices that go far beyond televisions. These include:

- Advanced A/V receivers with 8K passthru from brands like Anthem, Arcam, Denon, Integra, Marantz, McIntosh, Onkyo, Pioneer Elite, Sony ES, and Yamaha
- Switchers, matrix switcher and extenders from companies like BZBGear
- Smart phones from manufacturers including Asus, Lenovo, LG, and Samsung
- Tablets like the Apple iPad Pro with the M4 chip, which offers hardware accelerated 8K processing
- Computer monitors from Asus and Dell, as well as a 32:9 ultrawide gaming monitor from Samsung with 7680 x 2160 resolution

- VR/AR headsets via products like Apple Vision Pro, which displays 23 million pixels. Apple has also announced an immersive video platform that supports 180° 8K recordings with spatial audio
- Video walls and signage

8K commercial displays

Modular MiniLED and MicroLED commercial and residential video walls can be constructed in almost any aspect ratio and can deliver 8K or greater resolution. These displays are currently available from Barco, Christie, LG, Samsung, and Sony among others. They enable the creation of spectacular and unprecedented location-based viewing experiences. In some cases, the screen can surround a seated, passive audience. In others, active viewers can walk up close to the screen to examine specific details.

The immersive quality of 8K extends far beyond movie theaters to encompass a long list of new experiential applications. For example, the Sphere entertainment venue in Las Vegas has an interior screen with over 57 million pixels. (In contrast, 4K televisions display only 8 million pixels). The Sphere screen can seamlessly integrate content from ten 8K cameras for panoramic videos.

But Sphere is just one example. The use of video walls that approach or exceed 8K resolution is rapidly growing in public spaces.

Name	Application	Location	Millions of pixels
Marriott Marquis	Outdoor advertising	NYC Times Square	23.9
Mercedes-Benz Stadium	Sports arena	Atlanta	24.7
Comcast Experience	Corporate lobby	Philadelphia	28
Qin Han Tang Emporium	Retail	Xi'an	29
David Geffen Hall	Arts venue lobby	New York	50
Shiseido Global Innovation Center	Corporate lobby	Yokohama	64 (approx.)
Westfield Stratford City	Outdoor advertising/retail	London	250
Dubai Mall	Retail	Dubai	1,700

In addition, 8K shows great promise in other commercial applications:

- Theme park rides
- Meetings and rock concerts
- Museums & planetarium domes
- Visualization for science, oil exploration, automotive design
- Command & control centers
- Flight simulators

The visible benefits of 8K

By numbers alone, 8K is impressive. It delivers 7680 x 4320, roughly 33 million pixels. That's 4 times the pixel density of 4K. This advantage is clearly evident on high-contrast edges in the picture below.



In addition, 8K is a key component of the Ultra HD story that also includes Wide Color Gamut, High Frame Rates, and (especially) High Dynamic Range. But these facts barely hint at how 8K makes a visible difference.

Experiencing the 8K difference

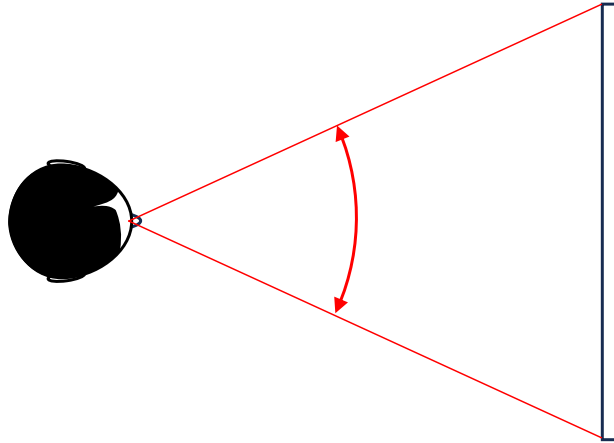
Unlike 4K, 8K delivers two powerful benefits: greater immersion and super realism. Consider immersion. As screen sizes approach 100 inches diagonal, 8K helps deliver a greater “you are there” effect, the “wow” factor of sitting close to a screen that occupies a wider field of view.

8K also excels at super realism, the ability to satisfy the hyper-acuity of the human visual system to deliver a greater sense of reality. This brings a range of benefits:

- **Reduced artifacts (“jaggies”) at high-contrast edges in the picture.** This could be where a rooftop meets the sky, or the contours of white closing credits against a black background.
- **Reduced cognitive load.** This means the brain doesn’t have to work as hard to “smooth out” images.
- **Better rendering of HDR and color gradients.** High Dynamic Range (HDR) delivers a wider range of tonal values, while 8K delivers more pixels on which to display those tonal values.
- **More realistic gameplay.** The super realism of 8K provides a more impactful and lifelike gaming experience for enthusiasts.

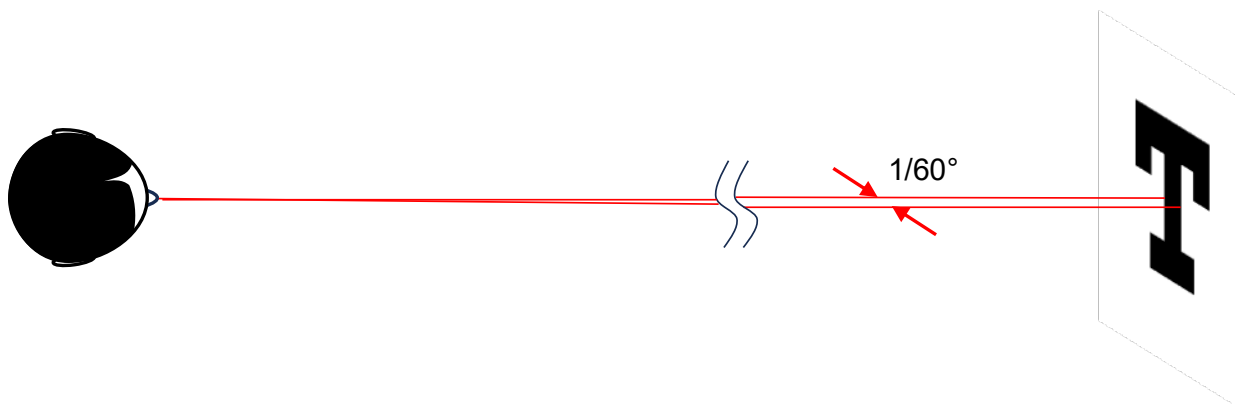
What is “super realism?”

An essential property of TV viewing is the screen’s horizontal field of vision (FOV). If you draw imaginary lines from your eye to the left and right sides of the screen, the horizontal field of vision is the angle between the two lines. Greater immersion goes hand-in-hand with higher horizontal FOV. And you can increase this immersion effect by buying a larger screen, or sitting closer to the screen, or both.



The viewer’s field of vision (FOV) is the angle from one side of an object to the other. In the case of television screens, horizontal FOV is the angle from the left edge to the right edge.

Normal, 20/20 vision is the ability to read eye chart¹⁵ characters that have square, pixel-like features with an FOV of $1/60$ degree (one minute of arc). This provides a simple rule of thumb - you need at least 60 pixels per degree for the television pixel grid to remain “invisible.” But if the TV picture looks good at 60 pixels per degree, it looks *even better* as you step further back from the screen. That’s because 60 pixels per degree is only one aspect of human visual acuity.

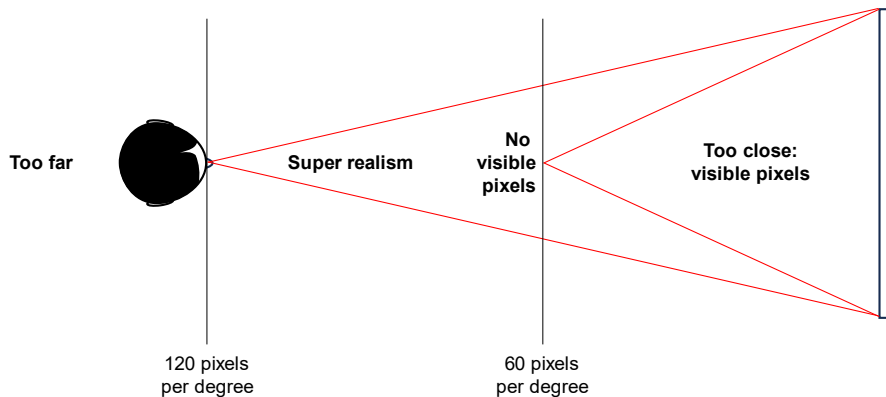


The smallest features of a character on the 20/20 line of a Snellen eye chart are precisely sized for an FOV of $1/60^\circ$ (1 minute of arc) when viewed from 20 feet. In metric countries this is described as the 6/6 line viewed from six meters.

E	1	20/200
F P	2	20/100
T O Z	3	20/70
L P E D	4	20/50
P E C F D	5	20/40
E D F C Z P	6	20/30
F E L O P Z D	7	20/25
D E F F O T E C	8	20/20
L E F O D P C T	9	20/15
F D F L T C H O	10	20/13
F H E O L O F T D	11	20/10

While 20/20 is a useful reference, human vision can extend down to 20/10. At 20/10, the characters are half the size of those on the 20/20 line and their smallest features occupy only 1/120° FOV.¹⁶

For example, some people have better than 20/20 vision. 20/10 vision enables a person to see details at 120 pixels per degree. And all of us have hyper-acuity, which enables us to see subtle misalignments and the gaps between two objects, even when these are much smaller than 1/60 degree.^{17,18,19} Generally, a television satisfies this hyper-acuity – and delivers near maximum super realism – when you experience 120 pixels per degree. Viewing becomes less like “watching television” and more like “real life.”



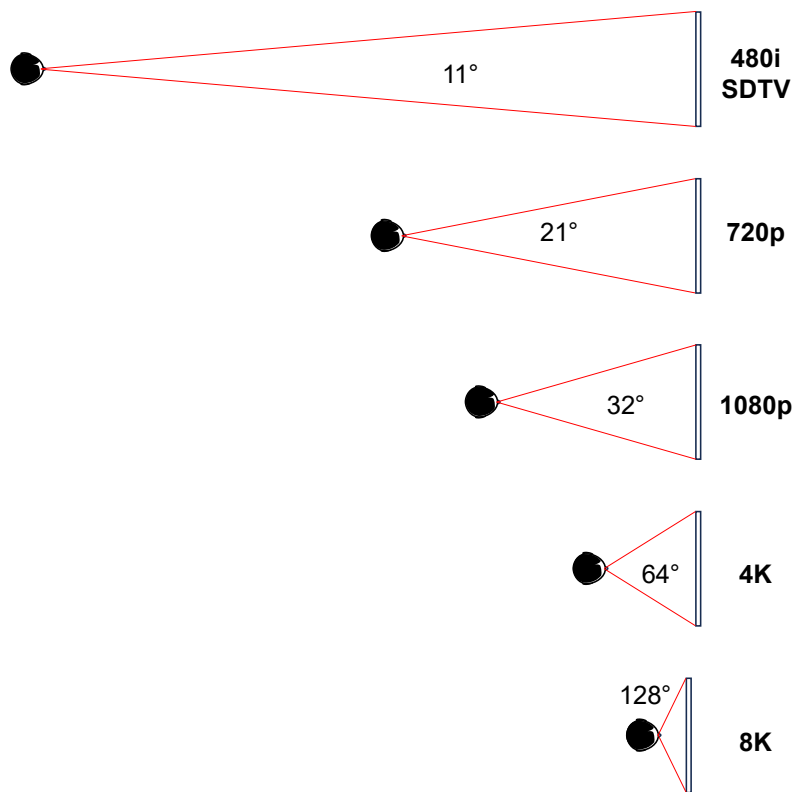
Sitting back from the television has its benefits: “super realism.”

Super realism is not just a theory. Repeated controlled experiments conducted by university and broadcaster research labs have confirmed these visible benefits.²⁰

Without being told which content was which, test groups could see the improvement. Asked to assign scores to the appearance of scenes, audience members gave images higher scores for “realness” and described on-screen objects as “more 3D” even though all the images were presented in 2D. Audiences scored on-screen objects as looking “heavier.” Scenes of food were scored as looking “more delicious.” And nature scenes were scored as “more beautiful.”^{21,22,23} This feeling was perhaps best summarized by a casual viewer who, looking at an 8K presentation of the 2012 Olympic Games in London remarked, “I could almost smell and feel the fireworks at the opening ceremony.”²⁴

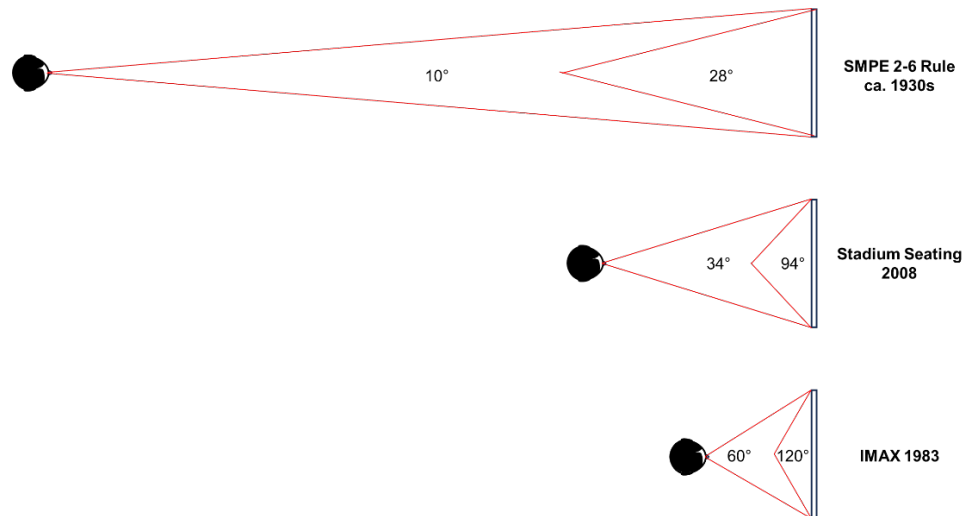
The benefit of sitting closer: greater immersion

Until now, super-realism has not been part of the typical TV experience. However, today’s viewers want to experience greater immersion. And they have powerful reasons to sit closer to bigger screens. In fact, we can chart the progress of screen resolution and see how television has enabled us to sit closer and closer, for a wider FOV and a more engaging user experience.



The trend in TV resolution is clear. Higher resolution enables you to sit closer and still enjoy a seamless picture. Shown here is the FOV for viewing at the reference of 60 pixels per degree. NOTE: While enthusiastic viewers may be motivated to sit this close to an 8K television, other viewers may prefer to sit further back where the advantages of 8K are still powerful.

While traditional motion picture film doesn't have pixels, the history of movie theater design^{25,26,27} demonstrates a similar, unmistakable trend toward wider FOV and greater immersion.



Cinema presentation has undergone a similar trend toward immersion, with IMAX theaters leading the way. Shown here are front-row and back-row FOV for three theater designs.

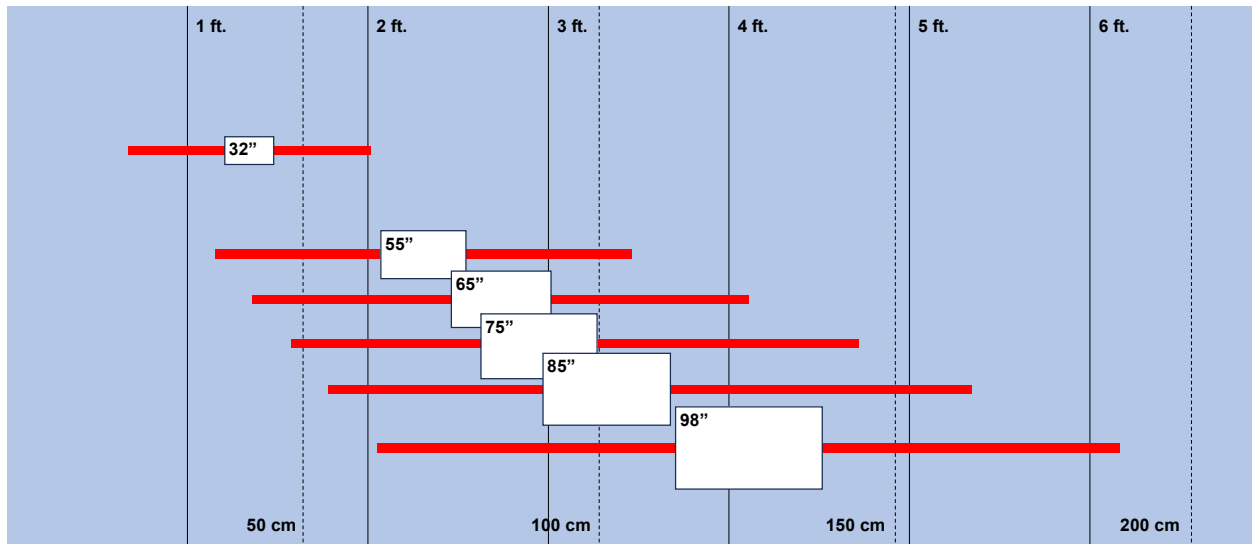
The limits of 4K

The arrival of 4K television was a milestone in the history of home viewing. With 4K, we finally had enough pixels to enjoy immersion on a par with the middle seat in a stadium seating movie theater (60°) without the pixel grid being visible (60 pixels per degree). This achievement remains impressive. However, 4K still falls short of the front rows of a movie theater – and the middle rows in an IMAX theater.

In addition, at 60° FOV, 4K does not and cannot deliver “super realism.” 4K confronts viewers with a choice. You can sit close to experience “you-are-there” immersion. Or sit back for super realism. *You cannot have both at the same time.* 8K delivers the best of both worlds: powerful immersion together with super realism.

8K viewing distances

Viewing distances are often ruled by practical considerations such as home décor, room design and space limitations, as well as types of content. What's best for videogames may not be ideal for movies or live sports. And individual visual acuity and personal preferences also play a part.



*These calculated viewing distances achieve 60° FOV (far) to 120° FOV (near).
Actual viewing distances will vary according to room design, content type,
personal preferences, etc.*

In short, when it comes to the ideal viewing distance for 8K, some will want to sit as close as possible, others will prefer to sit further back. There is a range of viewing distances that work well for 8K, including sitting close to the screen. This literally achieves immersion on a par with the seats near the front of an IMAX theater, for that elusive “wow” factor.

Conclusion

Thanks to recent advances in content production, display technology, and video processing, 8K has become a compelling value proposition and the new benchmark for experiencing premium entertainment.

- **For content creators**, 8K is a better way to preserve creative intent, enhance storytelling, and heighten emotional impact – all of which contribute to a more compelling presentation.
- **For motion picture exhibitors**, 8K offers the potential to provide theatergoers with a more premium experience that can generate greater revenue.
- **For electronics companies**, 8K is the means to engage more high-end customers and early adopters with products that are future-ready.
- **For AV specialty retailers and custom integrators**, 8K delivers the finest in-home entertainment while underscoring the inherent value of their expertise. 8K has become the natural starting point for high-end home theaters. It is the essential consideration when planning screen size and viewing distance.
- **Finally, for home theater enthusiasts**, 8K is simply the best way to enjoy entertainment at the highest level. In addition to being the ideal way to experience home entertainment today, 8K is specifically designed for the needs of tomorrow.

In summary, the benefits of 8K technology are easily evident. And those who ignore the power of 8K risk being left behind.

Notes:

1. International Telecommunication Union, "Parameter values for ultrahigh definition television systems for production and international programme exchange," Geneva, Switzerland, ITU-Recommendation BT.2020, 2012, https://www.itu.int/dms_pubrec/itu-r/rec/bt/R-REC-BT.2020-2-201510-I!!PDF-E.pdf
2. Display Supply Chain Consultants press release, May 20, 2024, <https://www.displaysupplychain.com/press-release/global-tv-shipments-declined-4-y-y-in-q124-samsung-remains-top-player-in-both-units-and-revenue>
3. Consumer Technology Association, "US Consumer Technology Five-Year Industry Forecast," January 2023
4. Display Supply Chain Consultants presentation to Display Week Business Conference, May 2023
5. Archer, Robert, "8K Video Has the Industry Excited, But Will it Excite Consumers?" *CEPro* January/February 2024
6. Mathur, Uday; Rehman, Abdul; Alvarez-Mesa, Mauricio; and Velhal, Ravi; Panel discussion: "8K Technology and its Impact on the Production Process," at NAB Show 2024, edited for greater clarity; <https://www.youtube.com/watch?v=YjHloxC2vCk>
7. Ibid.
8. Bob Gorelick interview with 8K Association, July 2024
9. Mathur, et. at. Ibid.
10. Ibid.
11. Ibid.
12. Stephanos, Merit Ariane, "Immersive live experiences: 8K Video, 3D audio and Beethoven's 9th," March 8, 2024; <https://spin-digital.com/events/8k-video-3d-audio-and-beethovens-9th/>
13. NVIDIA: Recommended 8K Titles, https://nvidia.custhelp.com/app/answers/detail/a_id/5090/~recommended-8k-titles
14. Isomae, Yoshitomo, et. al., "Development of Novel Liquid Crystal on Silicon Microdisplays and Future Application," *SID 2024 Digest*, pp 165-168
15. Snellen, H., *Probuchstaben zur Bestimmung der Sehscharfe*. Utrecht: PW van de Weijer, 1862
16. Image credit: Jeff Dahl via Creative Commons, updated to include callouts for 20/15, 20/13 and 20/10
17. Westheimer G., "Diffraction theory and visual hyperacuity," *American Journal of Optometry*, 53 (1976), pp. 362-364
18. Westheimer, G., McKee, S.P., "Spatial configurations for visual hyperacuity," *Vision Research*, 17 (1977), pp. 941-947
19. Sugawara, Masayuki, et al., "Research on Human Factors in Ultrahigh-Definition Television (UHDTV) to Determine Its Specifications," *SMPTE Motion Imaging Journal*, vol. 117, no. 3, 2008
20. McCarthy, Sean, "Quantitative Evaluation of Human Perception for Multiple Screens and Multiple CODECs," 2012 SMPTE Annual Technical Conference & Exhibition
21. Park, D., Kim, Y., & Park, Y. (2020). "Cognitive effect on image quality in full ultra-high definition (8K)," *Journal of Information Display*, 21(2), 103–111. <https://doi.org/10.1080/15980316.2019.1704895>
22. Sugawara, op. cit.
23. Long, Trevor, "Understanding 8K TV – Retina Is Not the Limit of Resolution: Your Brain Sees More," *EFTM.com*, November 21, 2018
24. M. Sugawara et al., "Super hi-vision at the London 2012 Olympics," *SMPTE Motion Imag. J.*, vol. 122, no. 1, pp. 29–38, Jan. 2013, doi: 10.5594/j18257XY
25. Sony Electronics, "Does 4K Really Make a Difference? 4K digital projection in the theater environment." 2nd Ed. May 3, 2010
26. Kiening, Hans, "4K+ Systems: Theory Basics for Motion Picture Imaging," *SMPTE Motion Imaging Journal*, April 2008, pp. 50-60
27. Shaw, William C., Douglas, J. Creighton, "IMAX® and OMNIMAX® Theatre Design" *SMPTE Journal*, vol. 92, no. 3, March 1983, pp 284-290

Industry Site: 8kassociation.com

Consumer Site: discover8k.com

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