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## Beyond HD: Exploring 4K and 8K Resolutions



This month we're exploring the wide world of 4K and 8K resolutions in regards to television. The 4K TVs that have hit the market in the last year are still relatively expensive, but they are slowly gaining popularity with the masses. While these new 4K TVs are still fresh on the market, Sharp just introduced a brand new TV with an even higher 8K resolution. The TV stands at 120" and has an asking price of \$133,000. This raises questions among consumers, which resolution to pick? Are these brand new technologies even worth their hefty price tags?

With everyone wanting the latest and greatest next big thing in the world of technology, consumers might find

these new TVs desirable for a few reasons. Their sharp picture to start with, as well as resolutions so high that their images appear almost lifelike. Resolution is defined as the degree of detail that is visible on a screen, and the number of pixels displayed on the TV. There are some interesting questions that arise in regards to these super high resolutions and how the human eye actually processes them. There has been controversy over the question of whether the naked eye can even view any resolution higher than 4K. This is important information for consumers to know: they may be shelling out big money for a resolution that their eyes won't even be able to see.

When 4K was originally introduced back in 2012 it was referred to as Ultra High Definition or "UHD" for short. This was the upgrade from 1080p, which had been the standard for the past few years. 1080p was referred to as "Full HD" with specs of 1920x1080. The new 4K resolution features a horizontal count of nearly 4,000 pixels, which is four times the amount of regular high definition TVs.

Curved TVs were hitting the market back when 4K was originally introduced, and with them came a whole new way of looking at TV. These new TVs were very expensive and had a whole new set of rules regarding how big your screen had to be and how far away you had to sit from it. The new 4K resolution requires a bigger screen to fit the new pixel amount. Newer 4K TVs are now coming out in smaller screen sizes under 60", but there are a lot of reviewers that are skeptical about how clear a 4K picture is on a smaller screen, and argue that 4K can only be appreciated on TVs 65" and up. Then there is the question of whether the naked eye can even discern a difference between 4K and 8K resolution. Although there is no concrete evidence at this time, the consensus seems to be that our eyes may be able to see a difference as long as there is a short distance between you and your TV. This means having to sit closer to an 8K TV than you would a 4K and an even shorter distance than a TV with 1080p resolution. Depending on how far away you sit from your television normally, consider that at ten feet away it's hard for the human eye to detect a difference between 1080P and its lower resolution predecessor 720p. That means that at the distance of ten feet away, the television's pixels are too small for the naked eye to recognize the difference in resolution. This is also assuming you have 20/20 vision. If you do, that means that your eyes can recognize sixty pixels per degree from around twenty feet away. So that means for a TV that is over 80" you would have to be around five feet away for your eyes to focus in and recognize 4K. According to studies, most Americans currently sit about nine feet away from their TVs. Sounds like most folks would have to reorganize their living rooms a bit.

One reason why 4K TVs are still in the fledgling stage of taking off is that a whole lot of 4K content isn't available yet. If you have a 4K TV and want to start streaming 4K content, you have a few options, but they are still extremely limited. Netflix offers a 4K "Ultra HD Plan" and while it is the highest priced plan available, it is still only around twelve bucks a month. A wide range of TVs will support Netflix Ultra HD, including the three main heavy hitter manufacturers: Samsung, Sony and LG. There are limited movie options available on Netflix, although they have come out to say they are planning to release more 4K content in the near future.

Amazon also offers 4K content as well, but they do require you to have an Amazon Prime account, which runs about \$99 a year. You can either stream movies directly, or rent them individually for short periods of time. Their UHD movies are still pretty expensive to purchase, with price tags running from \$20-\$30, but they will be yours to keep.

As far as cabling goes, [High Speed HDMI cables](#) that are currently on the market will support the 4K resolution (Ultra HD). This resolution among other features was introduced in HDMI's 2.0 specification detailed on HDMI.org. With the new UHD TVs and UHD content being released, Hollywood movie studios decided that they needed better protection for their content from piracy. HDCP is this protection, which stands for High-Bandwidth Digital Content Protection. HDCP itself is nothing new; however version 2.2 is what could cause problems with UHD content. In order to transmit 4K content, all devices need to be HDCP 2.2 compliant. That means Blu-ray players, audio/video receivers and UHD TV. Just because a component states 4K video and HDMI 2.0 that does not necessarily mean it is HDCP 2.2 compatible. This only affects 4K content though, so if you are watching a Blu-ray movie from your Blu-ray player that is HDCP 2.0 in 1080P on your 4K TV that is HDCP 2.2, it will have no problems.



Ultra High Definition 8K resolution, also known as Full Ultra HD, equals the dimensions of 7680x4320. This new 8K resolution gets its name from its 8,000 horizontal pixel count. While 4K has four times the resolution of 1080P, 8K is sixteen times more detailed than 1080P. When it comes to 8K technology, some ask the question of why so soon? By all accounts, 4K resolution is still slowly catching on with consumers, so why the push to jump to an even newer technology? Some feel that it is too much too soon, and that the knowledge of this technology will overwhelm consumers and ultimately set 8K up for failure. Not to mention, who is going to buy a brand new expensive 4K television when there is a newer technology right around the corner? At the same time, when 4K televisions still have expensive price tags, when will 8K TVs be affordable? Then there is the question of size. How large should the TV screen be to fit all those pixels? How many inches does the screen have to be to see the resolution clearly? So far, manufacturers are thinking that bigger is better. It is expected that 8K will only be visible on TVs 85" and larger. Will that be too large for mainstream consumers?

Naturally with the introduction of 8K resolution comes the question of what devices and cables will work with the new technology. While [High Speed HDMI cables](#) can pass 4K resolution, will they release a new HDMI cable that is capable of passing 8K? Earlier this year the rumor mill suggested that instead of HDMI, that a "Super MHL" connector will be introduced to replace the HDMI cable. Samsung and Sony, as well as a few other huge corporations have backed this new MHL technology since back in 2010 when it was first introduced. When it first hit the market MHL was the solution for transferring video from a mobile device to a television. This switch from HDMI to MHL might have to happen in the event that HDMI ports won't be able to carry enough data to support such a high resolution.

Cable companies and other manufactures have released 4K set-top boxes to solve the issue of programming 4K content. Because 4K resolution requires more bandwidth than regular HD, there have been issues with saving content to replay later. Some of these set-top boxes are introducing a new video compression standard called HEVC, or High Efficiency Video Coding. This breakthrough in video coding will compress a video stream's data in almost half. These set-top boxes also work if you have one of the earlier generations of 4K TVs that is not compatible with your cable company's requirements.

One of the biggest issues with 4K is how much of your cable company's designated bandwidth it will use up. 4K TV requires that you have a broadband data transfer speed of at least 25 megabits per second to begin with. As it stands today, some cable companies will allot a certain amount of data per month, and will place a cap on the amount that you use. While some companies allow you to go over your cap, you may be charged for your overage. Some cable companies offer 250-300GB per month, and 4K content eats up around 17GB per hour. Depending on how many shows or movies you watch per month, your designated data could get

used up pretty quickly. Many cable companies say that they add a cap to your data to prevent clogs and congestion, although this is debatable. There has been controversy lately surrounding the actual purpose of a data cap. Some of the biggest cable providers have alluded that there has to be a cap because there is a limited amount of data that can be transmitted at once, so users must share with each other. New evidence suggests that there is no truth to this, and that companies are imposing a cap in order to receive penalty funds. This may be one way that cable and Internet providers are punishing customers who only use their Internet for streaming versus paying for cable and Internet separately.

Retail predictions for this holiday season suggest that manufacturers will be releasing 4K TVs with smaller screens and price them more affordably in order to start pushing 4K sales. We will wait to see what screen sizes get released, and how the smaller screens will affect picture quality. As for 8K, while some of the leading television manufacturers have debuted their 8K prototypes at CES and other huge tradeshows, the consensus seems to be that if 8K televisions ever catch on it won't be until the 2020's. This prediction sounds about right, as it will allow manufacturers to get a handle on the technology before it is released to the masses. We will patiently wait to see if 8K resolution is just a drop in the bucket or if it will be the wave of the future.

Thank you for coming along with us on our journey through 4K and 8K resolutions. Please check back in with us for next month's technical article as we explore the different ways to figure out your device's model number and specifications. Cheers!

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