

Sun City Summerlin Computer Club

Seminar

**HDTV 2025
TVs and Content**

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October 11, 2025

Agenda

- **HDTV State of the Market**
- **HDTV Overview**
- **HDTV Technology Choices**
- **High Dynamic Range (HDR) & Wide Color**
- **Ultra HD (4K) TV**
- **Where to Get HD Content**
- **Web Links for Information**

HDTV State of the Market (1)

- **Virtually *all* TVs being sold are now HD widescreen 16x9 ratio.**
- **Costs have come down to match seniors' budgets.**
- **Virtually all HDTVs sold are “Smart” and can run all the popular streaming apps.**
- **About 81% of all U.S. Homes have at least *one* HD set. 79% have a “smart” TV.**
- **TV makers tried to sell 3-D as an upgrade. No longer offered.**
- **Newest “big things” are Ultra HD (4K) and High Dynamic Range (HDR).**
- **Some 8K (7680 x 4320 = 33.2 M-pixels) sets now being offered.**
- **High-end HDTVs use Organic LED (OLED) and Quantum Dot (QDot) screens.**

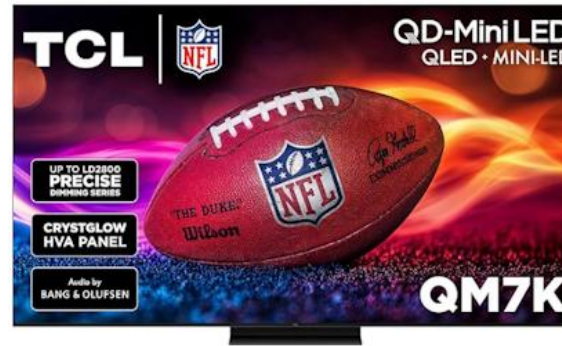
HDTV State of the Market (2)

- **Most program content is now being broadcast in HD 1920x1080 format.**
- **Movies look and sound better in HD with digital sound.**
- **Many classic movies & TV shows have been re-mastered/restored in HD.**
- **Much content is now available via Internet streaming.**
 - Even cable providers now delivering via streaming (no set top boxes).
 - Many free and paid services via the Internet.
 - Many name HDTV makers offer a large selection of free channels.
 - Some streaming sources are of dubious legality.
- **Coming - new standard for broadcast HDTV – ATSC 3.0**
 - Support for OTA broadcasts of UHD(4K), HDR, Wide-color.
 - <https://www.cnet.com/news/atsc-3-0-what-you-need-to-know-about-the-future-of-broadcast-television/>.
 - https://en.wikipedia.org/wiki/ATSC_3.0.

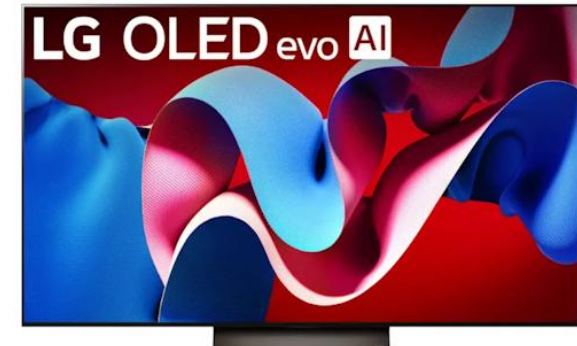
Example HDTVs



**Samsung 65" UHD / 4K QLED
Smart TV w HDR Samsung: \$530**



**TCL 65" UHD/4K QLED
Smart TV Amazon: \$798**



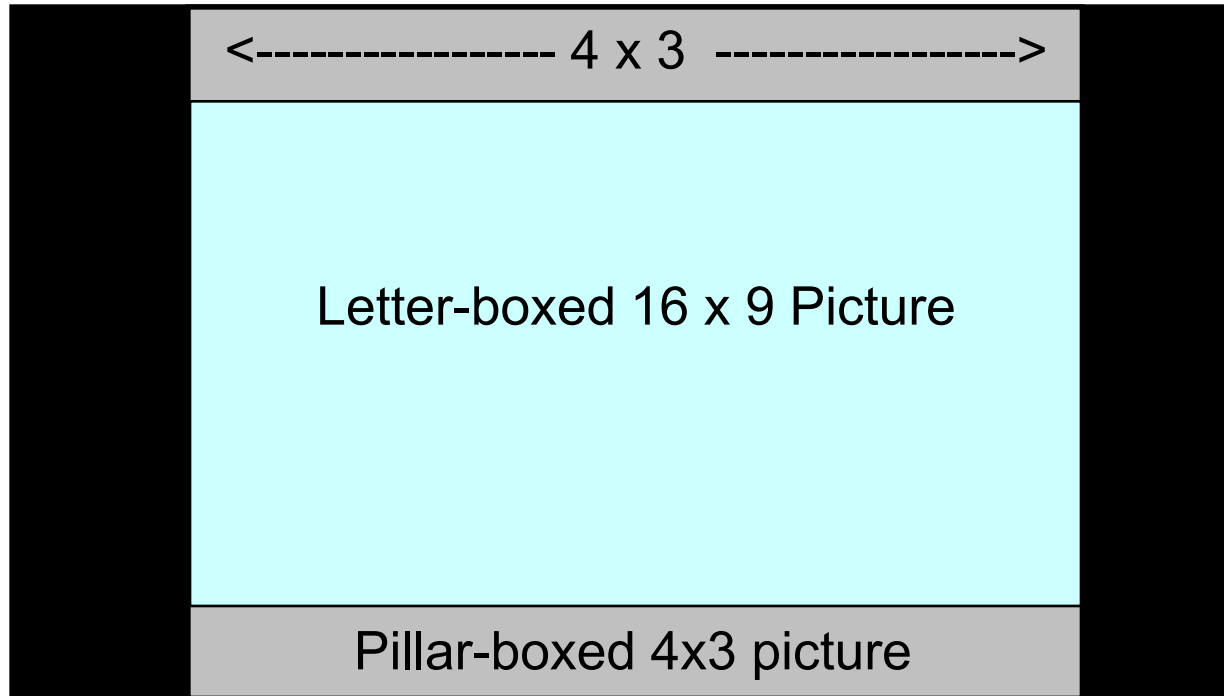
**LG 65" UHD/4K OLED Smart
TV w AI Best Buy: \$1400**

HDTV Overview

- **ATSC - Advanced Television Systems Committee**
 - All TVs sold now have an ATSC digital tuner built in.
 - Audio / video signal sent as stream of numbers representing compressed picture and sound.
 - Digital picture stream not affected by electronic interference; includes error detection & correction.
 - Result: “snow free”, crisp broadcast pictures, sound.
- **Standard Digital Television (SDTV) – largely outmoded**
 - Circuits in digital TV receive, decode and display (either 640 x 480 or 704 x 480).
 - Older sets usually can also accept “analog” signals (dual tuner).
- **High-definition Digital Television (HDTV)**
 - Adds higher picture quality and widescreen modes.
 - Standard (4 x 3) and Widescreen (16 x 9) aspect ratios.
 - 480p, 720p, 1080i, 1080p and 2160p horizontal scan line density.

TV Aspect Ratios

<----- 16 x 9 ----->



HDTV Connections

- **High-Definition Multi-media Interface (HDMI 2.0) - Best**
 - All digital
 - Combines video & sound in one signal cable
 - Can be passed through newer stereo receivers
 - Most HDTVs now have two to four HDMI connectors
 - **Cheap HDMI cables work fine!**
- **Component Video (red, green, blue wires) - Good**
 - Supports HD & widescreen (1080i only)
 - Need separate cable (digital or analog) for audio
- **S-Video - Fair**
 - Analog standard definition signal (e.g. from VHS deck)
 - Need separate RCA audio cables
- **Composite Video – *Don't bother!***
 - Analog standard definition (e.g. from VHS deck)
 - Need separate RCA audio cables

HDTV Technology – LCD Flat Panel

- Comes in widescreen 16 x 9 aspect ratio.
- Vertical scan resolutions
 - 720p (often listed as 1366 x 768) on small sets - 1 M-pixels
 - 1080p (1920 x 1080) - 2 M-pixels
 - 2160p (3840 x 2160) - 8 M-pixels
 - 4320p (7680 x 4320) - 32 M-pixels
- Screen sizes (diagonal) 19” up to 100” & beyond.
- Excellent brightness, good contrast.
- Relatively light.
- Low power consumption.
- Backlight life: 60,000 hours or more (LED).
- Low to moderate cost, lots of deals.

LCD Flat Panel – What's New?

- Screen sizes (diagonal) now up to 100+”.
- Four colors (red, green, blue, yellow) from Sharp
- Refresh rates: 120 Hz, 240 Hz and higher
 - More expensive 240 Hz is mostly overkill for TV
- Dynamic contrast ratios
 - 50,000, 100,000, 200,000, ...
 - Overstated – can't really see the difference.
- Response Times: 6 ms, 4 ms, 2 ms
 - Claim to reduce motion blur
- LED backlighting
 - A bit more expensive, but coming down
 - Brighter picture, higher contrast, longer life
- Cinema Modes (24 frames per second)
 - Better for watching movies

HDTV Technology – OLED



LG 77" Class - OLED 2160p AI
Smart 4K HDTV – LG.com: \$2600

- <https://www.lg.com/us/oled-tvs>
- <http://www.oled-info.com/oled-tv>
- **Picture is produced by Organic Light Emitting Diodes (OLEDs)**
 - Very fast response time
 - Very thin screens (4 mm)
 - Very high contrast ratios
 - Low power consumption
 - Flexible screens
 - May use *four* subpixels: white, red, green, blue in each screen pixel
- Comes in widescreen 16 x 9 aspect ratio.
- Horizontal scan density
 - 2160p (4K) and 1080p
- Sizes from 55" to 77" diagonal
- Currently LG and Samsung are main producers of OLED screens.
- Screens are expensive and may suffer "burn-in".

HDTV Technology – Front Projection



BenQ DLP 4K Projector 3200
Lumens \$1,499

https://www.bhphotovideo.com/c/product/1686755-REG/benq_tk700_3200_lumen_4k_uhd.html

- Comes in widescreen 16 x 9 aspect ratio.
- Horizontal scan density
 - Now up to 2160p – most are 1080p, some 720P (XVGA)
- Screen size (diagonal) up to 150” or more
- Excellent resolution, brightness, good contrast.
- For best picture, need a screen or clean white wall.
- Projectors use either:
 - DLP (various vendors)
 - 3 LCD (Epson)
- Latest lamps last 4,000 hours.
- Projectors cost \$300 - \$6000
- Probably want to use a ceiling mount but can also set on a table.
- Short “throw distance” allows large picture from a close position.
- Need a room that can block most incoming light.
- No reflections from projector screen

Major HDTV Manufacturers

- Samsung – LCD
- Sharp - LCD
- Sony - LCD
- Panasonic – LCD
- LG – LCD, OLED
- Toshiba – LCD
- TCL - LCD
- Hisense - LCD
- Vizio – LCD
- Epson - Projectors

High Dynamic Range (HDR) & Wide Color

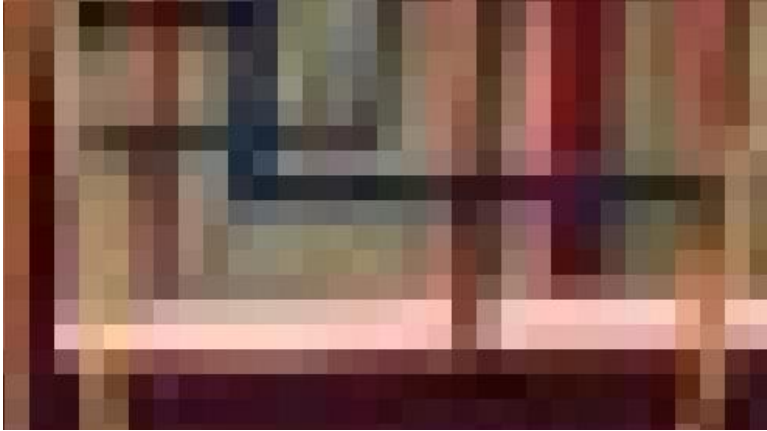
- **New Enhancement for Wider Contrast and Wider Color Gamut**
 - <http://www.pcmag.com/article2/0,2817,2490643,00.asp>
 - <http://www.lg.com/us/experience-tvs/hdr>
- **Wide-color has 1.07 billion colors (vs 16.8 million for Std-color)**
 - UHD HDR wide-color videos are larger – more color information per pixel:
3840 x 2160 x 4 bytes per frame = 33,177,600 (uncompressed) bytes per frame.
 - Wide-color sets can accept Std-color inputs and up-convert them.
- **Need a HDTV that supports full HDR contrast range & wide-color**
 - Pixels need to have 1024 discrete intensity settings for each color.
 - LCD sets with HDR use variable intensity LED backlight zones.
 - OLED sets emit light, so have darkest blacks, brightest whites.
- **Two Competing Content Standards: HDR10 and Dolby Vision**
 - Most HDTV sets support both codecs, but check.
- **For actual HDR & wide-color effect, video sources must be *mastered* in HDR.**
 - Will probably need special UHD / HDR blu-ray disc players.
 - Some Internet and satellite HDR UHD content is available.

Ultra HD (4K/8K) TV Technology (1)

- **New very high-resolution standard**
 - 3840 x 2160 pixels (16 x 9) – 4K (8 Megapixels per frame).
 - 7680 x 4320 (16 x 9) – 8K (32 Megapixels per frame).
 - http://en.wikipedia.org/wiki/Ultra-high-definition_television.
 - Ultra HD used in theaters for digital projection.
- **Native Ultra HD has smoother curves and diagonals**
- **Mostly 4K sets as of mid-late 2025**
 - Prices coming down fast with competition.
 - Almost no 1080P sets over 55 inches.
- **Various screen sizes from 96” down to 40”**
 - Samsung “Wall” is 292” diagonal.

Ultra HD (4K/8K) TV Technology (2)

4K Resolution (3840 x 2160 pixels)



1080p Resolution (1920x 1080 pixels)



92" 4K set is about 48 dpi h/v

Original Image



46" 1080p set is about 48 dpi h/v

46" 2160p set is about 96 dpi h/v

Ultra HD (4K/8K) TV Technology (3)

- **Cost and technology considerations**
 - Ultra HD (4K) TV sets now common, prices very reasonable.
 - True Ultra HD (4K) content is increasing but still sparse.
 - May want to get a new 4K Blu-ray player to play 4K Blu-ray discs (streaming an alternative).
 - Satellite and cable services don't have the bandwidth to deliver 4K unless they bond two channels or use very high compression.
 - 4K sets have built-in *up-convert* circuits to take 1080i/1080p content and display it at "near" 4K resolution. Picture quality may vary.
 - New 4K Blu-ray players will presumably also provide up-conversion to 4K.
 - 4K movies will require more expensive dual-layer 50GB discs.
 - Streaming services (e.g. Netflix) have increasing 4K content but may charge extra.
- **4K only makes sense in HD projectors and very large TVs?**
 - Sets with screen diagonal $\geq 55''$
 - Projectors to screens $\geq 80''$
 - On very large screens, 1920 x 1080 pixels become visible, especially when sitting relatively close.
 - Several new movies are being shot in digital 4K UHD for theater projection.

Where to Get HD Programming?

- **Over the air broadcast (local channels)**
 - Use an indoor, attic mount or roof-mount antenna
 - Indoor reception a bit spotty in SCS (transmitters in Henderson)
- **Cox cable (has Digital TV and HDTV options)**
- **DirecTV (satellite)**
 - Option for HD (~170 channels).
 - Option for local channels in HD.
- **Dish Network (satellite)**
 - Option for HD.
 - Option for local channels in HD.
- **CenturyLink Prism**
 - Uses a DSL (copper) connection to provide digital TV service.
 - HD only available if your home is close to a “Node”.
 - Mixed success in SCS but improving as more Nodes are deployed.

What is Cutting the Cord?

- **Being able to get entertainment, news and other TV programming *without* using a cable or satellite service.**
 - Instead, you use a high-speed Internet connection combined with over-the-air broadcast TV.
 - May include subscriptions to paid and free “video on demand” services like NetFlix, Hulu, Vudu, Tubi, Fubo, Pluto or Amazon Prime TV.
 - Also includes “broadcast” services like YouTube TV, sling TV and Hulu +.
 - Idea is that total cost is less while keeping access to most of the programming you enjoy.
- **Possible to also get rid of your CenturyLink land line phone service**
 - Cellphone Only
 - Voice over IP services (Vonage, Ooma, Magic Jack)

Paid and Free Internet Streaming

- Many “Smart” HDTVs now have built-in wireless (and wired) connections to your router.
- “Dumb” HDTVs need a HDMI feed from a PC, BD player or streaming device to a port on the HDTV.
- Popular Services – many with free trials:
 - <https://www.consumerreports.org/streaming-video-services/guide-to-subscription-streaming-video-services/>
 - NetFlix - <http://www.netflix.com>
 - Hulu - <https://www.hulu.com>
 - Vudu - <https://www.vudu.com>
 - Amazon Prime - <https://www.amazon.com/Prime-Video/b?node=2676882011>
 - You-Tube - <https://www.youtube.com>
 - YouTube TV – <https://tv.youtube.com>
 - Google Play - <https://play.google.com/store>
 - SlingTV - <https://www.sling.com>
 - DirecTV Stream - <https://www.directv/stream>
 - Also, many TV network websites.
 - <http://www.makeuseof.com/tag/yes-you-can-watch-tv-online-legally-and-for-free/>

Helpful Web Links

<http://shopper-zdnet.com.com/>

<http://electronics.howstuffworks.com/hdtv.htm>

<http://www.howstuffworks.com/3d-tv.htm>

<http://www.alltv lamps.com/>

<http://www.google.com>

<http://www.lg.com/us/tvs/lg-HECTO-laser-tv>

<http://www.blu-ray.com/info/>

<http://en.wikipedia.org/wiki/HD-DVD>

<http://www.hdtvauthority.com/index.htm>

<http://www.frys.com> <http://www.outpost.com>

<http://www.bestbuy.com>

<https://www.zdnet.com/home-and-office/home-entertainment/i-changed-these-5-tv-settings-to-dramatically-improve-the-picture-quality/>

<http://www.costco.com>

<http://www.walmart.com>

<http://www.cox.com/lasvegas/>

<http://www.directv.com>

<http://www.dishnetwork.com>

<http://www.centurylink.com/prismtv/#index.html>

<http://www.netflix.com>

<http://www.hulu.com>

<http://www.slingtv.com>

<http://www.youtube.com>

Questions and Answers