Plasma vs. LCD vs. LED: Which HDTV Type is Best?

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The Basics: What's the Difference Between LCD, LED, and Plasma?
The three technologies are vastly different, particularly with respect to how each screen is lit. In plasma HDTVs, the phosphors that create the image on the screen light up themselves, and don't require backlighting. For LCD HDTVs, however, the liquid crystal screen does not illuminate, requiring a separate light source. That's where the difference between "regular" LCD screens (also known as CCFL-backlit LCD) and LED-backlit LCD screens (also known as LED-LCD, or just LED screens) come in. Traditional LCD HDTVs use cold cathode fluorescent lights (CCFLs) to illuminate the screen. CCFLs are similar to the fluorescent lights you might see in some lamps and overhead light fixtures. They use a charged gas to produce light. LED screens, like their name implies, use light emitting diodes (LEDs) to illuminate the display. LED backlighting has become much more common in the last few years, and CCFLs are now generally only seen on budget HDTVs.

Several factors can be influenced by the type of HDTV display you choose. Among them, the most prominent are screen thickness, brightness, darkness, energy efficiency, and price. Ideally, you want an HDTV that's affordable, paper-thin, can get face-of-the-sun-bright and black-hole-dark, and consumes less than a watt. That's currently impossible, but LED-backlit LCD HDTVs can come closer than the other two technologies.

For this advantage, LED HDTVs command a premium; for all major HDTV manufacturers, LED-backlit HDTVs typically cost more than CCFL-backlit HDTVs of the same size. However, LED HDTVs have become standard for both midrange and high-end models, as CCFL screens have been relegated to the budget category. Generally, plasmas tend to be less expensive than LEDs but slightly more than CCFL-backlit HDTVs. That savings means the screen will be thicker and more power-hungry, though, even if it does tend to offer as good a picture as an LED-backlit HDTV.

Image Quality
How good the picture looks, especially if you're a videophile or a cinema fanatic, is the most vital aspect of any HDTV. Specifically, peak white and black levels determine how detailed an image will appear. Poor white levels mean fine details can get washed out in bright scenes, while poor black levels mean shadows swallow up parts of the picture in dark scenes. A very wide gamut from dark to light lets the HDTV show the tiniest details, regardless of how bright or dark the movie gets. In our tests, we measure white and black levels by luminance using a Chroma Meter. A mediocre HDTV might produce black levels of 0.05 to 0.07 cd/m2, while an excellent HDTV will offer levels of 0.01 to 0.03 cd/m2. Historically, plasma HDTVs have produced the best black levels, specifically the discontinued Pioneer Kuro HDTV brand. The Kuro's screen got so satisfyingly dark that it remained a popular HDTV for enthusiasts long after Pioneer stopped making the sets. The domination of plasma in this field, however, is over. Our current Editors' Choice HDTV, the LED-based Sharp Elite Pro-60X5FD , puts out 0.01 cd/m2, the best level we can measure. That any LED-backlit LCD can get that dark shows how far the technology has come.

White levels don't matter quite as much, because it's more difficult for screens to show fine details in shadows and easier to crank out very bright whites with backlighting, but they can still matter. At this, LED backlighting again triumphs. The Sharp Elite Pro-60X5FD reaches a very impressive 382.62 cd/m2 white level, and combined with that 0.01 cd/m2 black level, you get a staggering 38,262:1 contrast ratio. It completely (and literally) outshines the Panasonic TC-P55ST50 plasma, which puts out only 85.45 cd/m2 peak white while offering a 0.03 cd/m2 black level for a comparatively low 2,848:1 contrast ratio. Plasma screens were once the kings of contrast and color, but the Sharp Elite series has successfully taken the crown from the Pioneer Elite Kuro plasma series of years ago,

once considered the gold standard for HDTVs. Granted, less expensive LED HDTVs don't reach the Sharp Elite's performance, but they still often produce valiant showings. While plasma HDTVs don't tend to get quite as bright, the colors and black levels usually make up for it (though you probably won't notice that in the store, where all HDTVs are set to be as bright and vivid as they can be to catch your eye, with little thought for color accuracy).

Size and Power

Screen thickness isn't the most important aspect of an HDTV, but initially, it's the most noticeable. A super-thin HDTV is not only visually striking, but it's more easily mounted on a wall, and can be more readily arranged, displayed, or concealed as part of your home theater. On this point, LED screens win hands-down, with plasma close behind. The CCFLs that backlight low-end LCD screens are much thicker than LEDs. LEDs can be very thin yet extremely bright, meaning an array of LEDs along the edge of an LCD can light it up while completely removing the backlight from the equation (this configuration is termed "edge lighting"). At this point, though, array backlighting is thin enough to compete with edge lighting.

Plasma HDTVs also weigh more than LED-backlit LCD HDTVs. The 60-inch LED-based Samsung UN46ES8000F LED HDTV weighs 45 pounds without a stand, while the 55-inch Panasonic TC-P55ST50 plasma HDTV weighs 62 pounds but offers less screen area.

Energy efficiency is an important factor when choosing an HDTV, and between the three technologies LED-backlit HDTVs win again. LED HDTVs measuring 55 inches or less consistently consume around 80 watts or less, while plasma HDTVs can eat up two or three times as much. The 55-inch LG 55LW9800 LED HDTV consumed only 89 watts in our tests, while the 55-inch Panasonic TC-P55ST50 plasma HDTV used a whopping 305 watts. That's over three times the power for the same screen size.