Institute of Engineering
JIWAJI UNIVERSITY

PRESENTATION
ON
TV & RADAR

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EL- 804

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Colour television camera

Introduction:

The following section gives an overview about the Colour television Camera.

Overview of Colour Television camera:

- Figure 25.5 shows a simple block schematic of a colour TV camera.
- It consists of three camera tubes in which each tube receives selectively filtered primary colours.
- Each camera tube develops a signal voltage proportional to the respective colour intensity received by it.
- Light from the scene is processed by the objective lens system.
- The image formed by the lens is split into three images by means of glass prisms.
- These prisms are designed as diachroic mirrors.
- A diachroic mirror passes one wavelength and rejects other wavelengths (colours of light).
- Thus red, green, and blue colour images are formed.

The rays from each of the light splitters also pass through colour filters called trimming filters.

- These filters provide highly precise primary colour images which are converted into video signals by image-orthicon or vidicon camera tubes.
- Thus the three colour signals are generated.
- These are called Red (R), Green (G) and Blue (B) signals.
- Simultaneous scanning of the three camera tubes is accomplished by a master deflection oscillator and sync generator which drives all the three tubes.

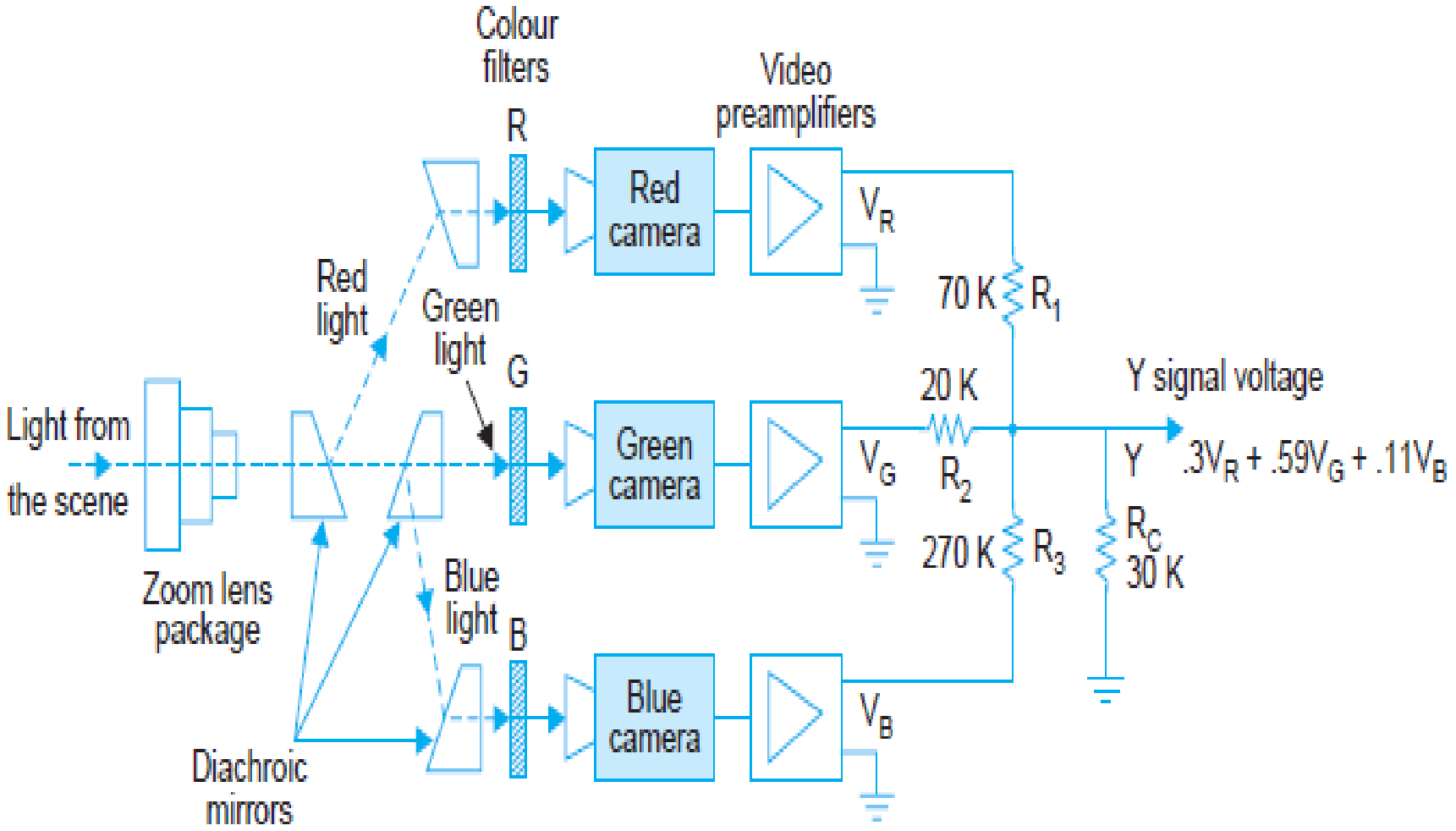


Fig. Plan of a colour television camera showing generation of colour signals and Y matrix for obtaining the luminance (brightness) signal.

Trintron colour picture tube

Introduction:

The Trintron or three in-line cathodes colour picture tube was developed by 'SONY' Corporation of Japan around 1970.

Overview of the Trinton Colour Picture Tube:

- It employs a single gun having three in-line cathodes.
- The three phosphor triads are arranged in vertical strips as in the P.I.L. tube.
- Each strip is only a few thousandth of a centimetre wide.
- A metal aperture grille like mask is provided very close to the screen.
- It has one vertical slot for each phosphor triad.
- The grille is easy to manufacture and has greater electron transparency as compared to both deltagun and P.I.L. tubes.
- The beam and mask structure, together with constructional and focusing details of the Trintron are shown in Fig.
- The three beams are bent by an electrostatic lens system and appear to emerge from the same point in the lens assembly.

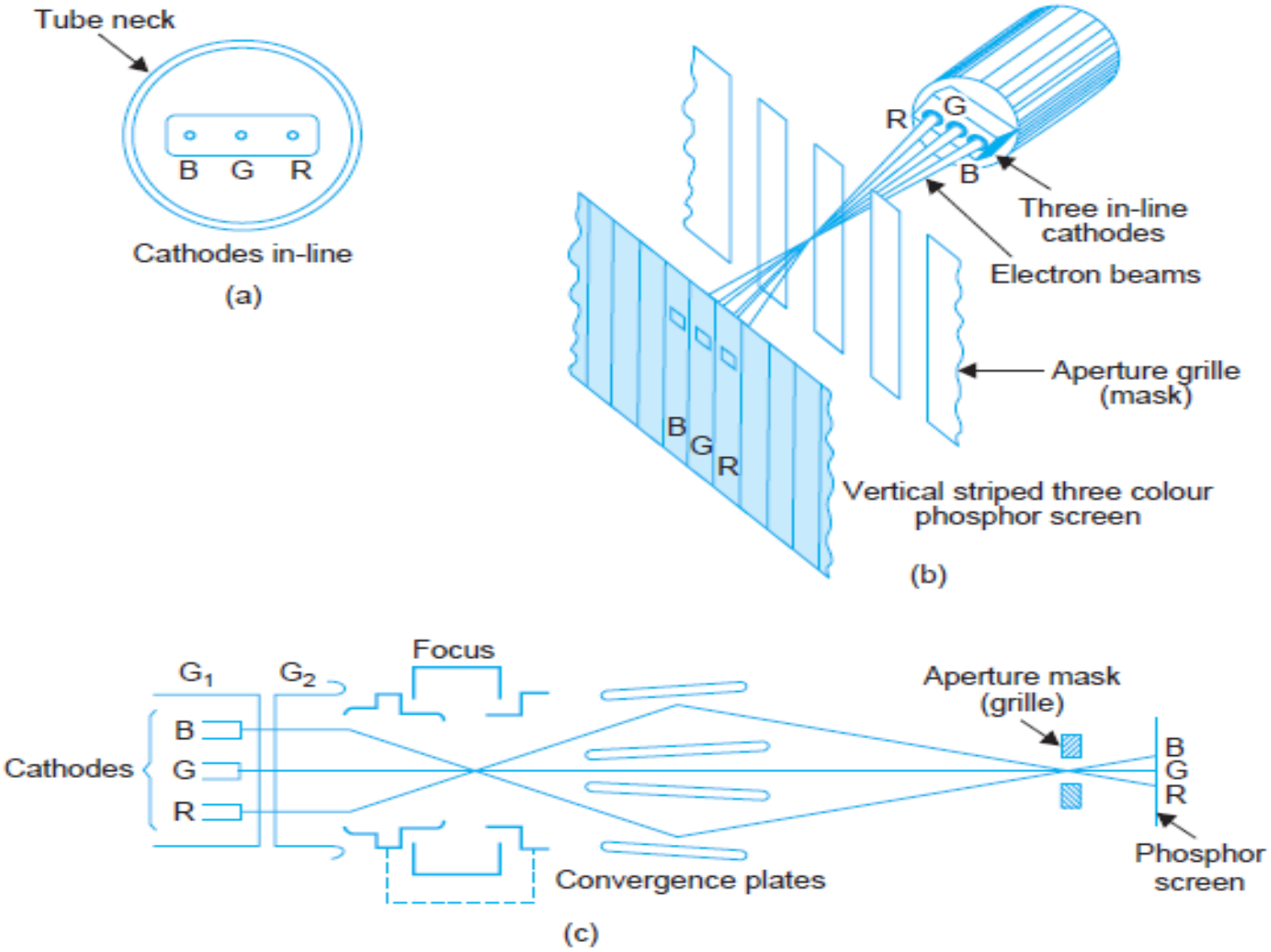
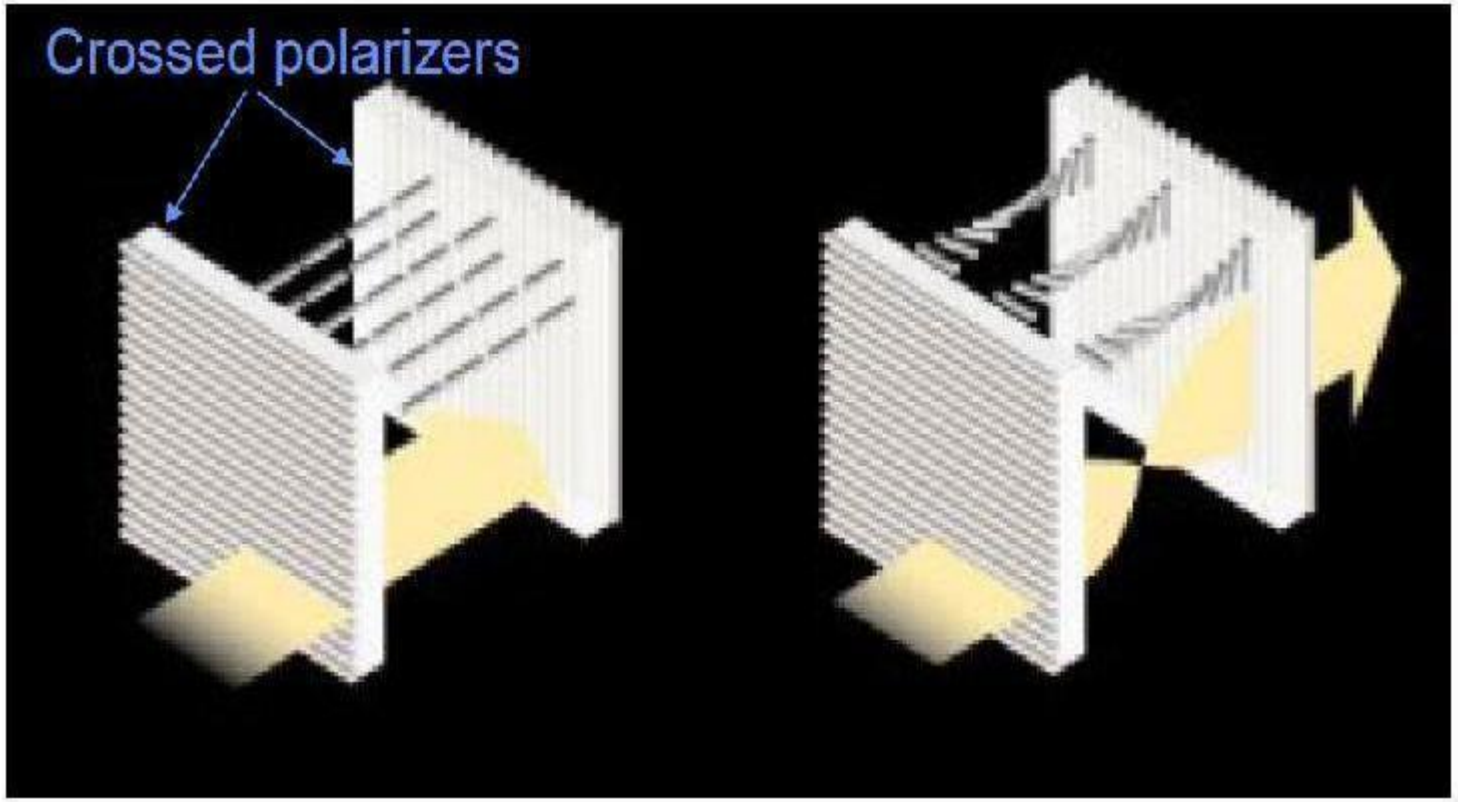


Fig. Trintron (cathodes in-line) colour picture tube (a) gun structure (b) electron beams, vertical-striped three colour phosphor screen (c) constructional, focus and convergence details.

Liquid CrystalDisplay (LCD)

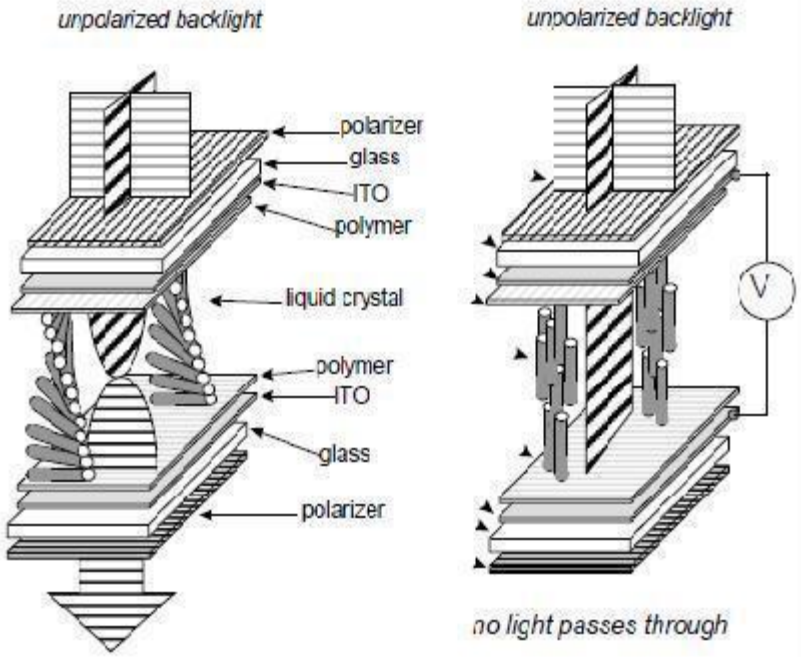
- A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers.
- Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome
- LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock.
- They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements.
- LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement.
- LCDs are used in a wide range of applications, including LCD televisions, computer monitors, instrument panels, aircraft cockpit displays, and indoor and outdoor signage.
- Small LCD screens are common in portable consumer devices such as digital cameras, watches, calculators, and mobile telephones, including smartphones.
- LCD screens are also used on consumer electronics products such as DVD players, video game devices and clocks.



Liquid crystal (off state)

Liquid crystal (on state)

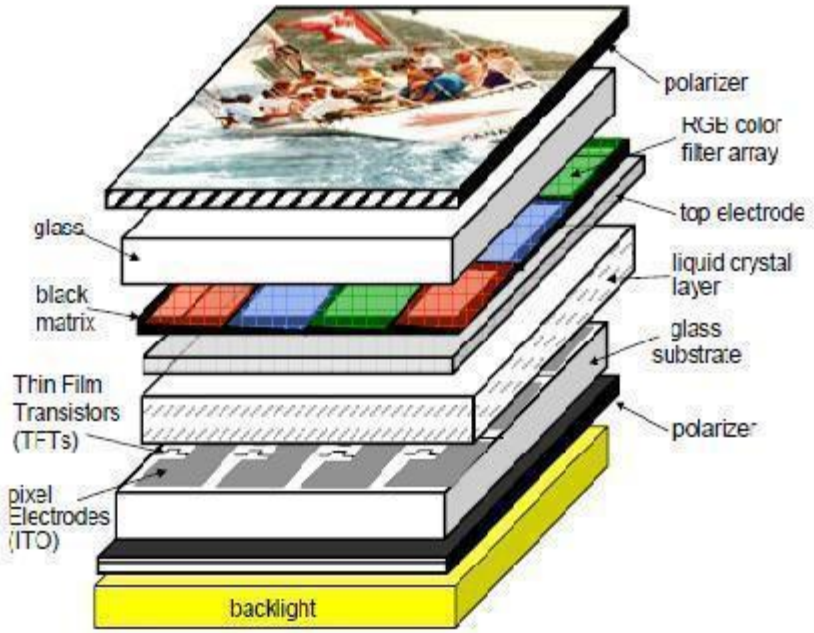
LCD Voltage Control



Voltage Field Off
(V=0)

Voltage Field On
($V > V_{threshold}$)

LCD System



- Instead of the crystals and electrodes sandwiched between polarized glass plates, in LCOS devices the crystals are coated over the surface of a silicon chip.
- The electronic circuits are etched into the chip, which is coated with a reflective surface. Polarizers are in the light path before and after the light bounces off the chip.

Advantages over conventional LCD Displays:

- Easier to manufacture.
- Have higher resolution because several million pixels can be etched onto one chip.
- Can be much smaller.
- Little heat emitted during operation, due to low power consumption.
- The possible ability to have little or no flicker depending on backlight technology.

Disadvantages

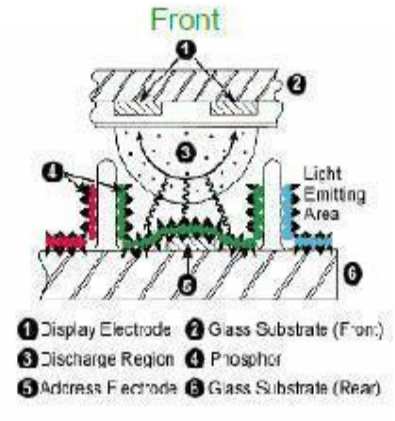
- Limited viewing angle in some older or cheaper monitors, causing color, saturation, contrast and brightness to vary with user position, even within the intended viewing angle.
- Black levels may not be as dark as required because individual liquid crystals cannot completely block all of the backlight from passing through.
- Loss of contrast in high temperature environments.

Plasma display

- Gas Plasma Display = An array of cells (pixels) composed of 3 sub pixels: red,green & blue. An inert (inactive) gas surrounding these cells is then subjected to voltages representing the changing video signal; causing the gas to change into a plasma state, generating ultra-violet light which reacts with phosphors in each sub pixel. The reaction generates colored light.
- A **plasma display panel** (**PDP**) is a type of flat panel display that uses small cells containing plasma: ionized gas that responds to electric fields.
- plasma displays were commonly used in large televisions (30 inches (76 cm) and larger). Since then, they have lost nearly all market share due to competition from low-cost LCDs and more expensive but high-contrast OLED flat-panel displays.
- The plasma that illuminates the screen can reach a temperature of at least 1200 °C (2200 °F). Typical power consumption is 400 watts for a 127 cm (50 in) screen.
- Plasma screens are made out of glass, which may result in glare on the screen from nearby light sources.
- The lifetime of the latest generation of plasma displays is estimated at 100,000 hours (11 years) of actual display time, or 27 years at 10 hours per day.

Gas Plasma Displays

Emissive rather than transsmitive

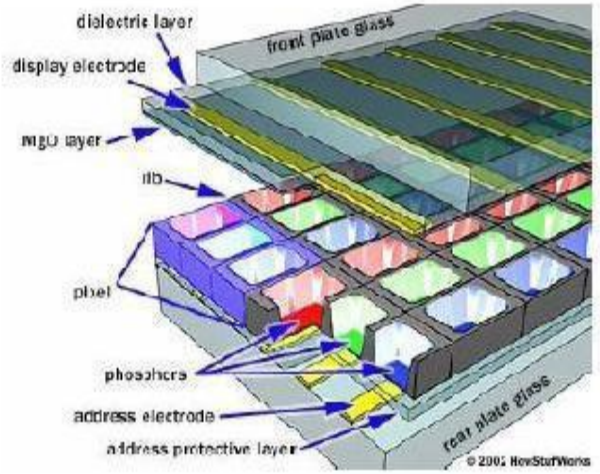


Step 1: Address electrode causes gas to change to plasma state.

Step 2: Gas in plasma state reacts with phosphors in discharge region.

Step 3: Reaction causes each subpixel to produce red, green, and blue light.

Gas Plasma Displays



The Address electrodes sit behind the cells, along the rear glass plate in horizontal rows.
The Display electrodes, which are transparent, are are mounted above the cell, along the front glass plate in vertical columns.

Gas Plasma

- Extremely thin (3"-6" typically), & produce sharp images because do not use complicated optics & lens assemblies.
- Images are relatively bright with very high contrast ratios.
- Have nearly a 180 degree viewing angle with no light drop-off! (LCD and DLP Televisions approx 160 deg).
- Technology is highly complex & relatively expensive.
- Relatively weighty and consumes more power than typical video displays. Sometimes require internal cooling fans (like LCD, DLP, & CRT projectors).

Plasma vs LCD

Advantages Of Plasma Displays Over LCDs

- Viewing angle of Plasma: 160 degrees+, ~ 90 degrees vertically vs. LCDs: up to or less than 160 degrees horizontally
- Size much larger Plasma 32-61 inches vs LCD 2-28 inches.
- Plasma is Emissive (internal) vs LCDs are Transmissive (External backlight).
- Switching speeds: Plasma <20ms (video rates) vs LCDs>20ms (may have image lag at video rates)
- Color technology: Plasma uses Phosphors (Natural TV colors) vs LCDs use Color Filters (Not the same color system as TV).

Advantages

- Capable of producing deeper blacks allowing for a superior contrast ratio.
- As they use the same or similar phosphors as are used in CRT displays, plasma's color reproduction is very similar to that of CRTs.
- Unaffected by clouding from the polishing process. Some LCD panel types, like IPS, require a polishing process that can introduce a haze usually referred to as "clouding".
- Less expensive for the buyer per square inch than LCD, particularly when equivalent performance is considered.

Disadvantages

- Plasma displays are generally heavier than LCD and may require more careful handling such as being kept upright.
- Earlier generation displays were more susceptible to screen burn-in and image retention. Recent models have a pixel orbiter that moves the entire picture slower than is noticeable to the human eye, which reduces the effect of burn-in but does not prevent it.
- Uses more electrical power, on average, than an LCD TV using a LED backlight. Older CCFL backlights for LCD panels used quite a bit more power, and older plasma TVs used quite a bit more power than recent models.

THANK YOU