FOURTH WAVE IN DISPLAYS

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Fourth wave in displays

Brighter, lighter, monitors; giant TV screens that you can roll up; see−through walls; wallet photos that move. Anand Parthasarathy looks at the technology that makes these possible.

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Inkjet process was used to deposit the organic layers during fabrication of the world's largest OLED−based displayed screen.

FIRST THERE was the Cathode Ray Tube or CRT −− still the technology behind the vast majority of computer monitors and television screens. Streams of electrons are accelerated by high voltage anodes, formed into three coloured beams by focusing electrodes and projected on a phosphorescent screen where they fuse to create the moving picture.

Then came the Liquid Crystal Display or LCD: Two sheets of polarising material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.

Each crystal, therefore, is like a shutter, either allowing light to pass through or blocking the light. For intense colour, LCD displays use what are known as Thin Film Transistors (TFT), where each sub−pixel or coloured dot in the display has its own active controlling transistor.

With the coming of home theatre systems, customers demanded larger and brighter screens up to 60 inches diagonally. The need was met by the Plasma display, an

emissive flat panel, where light is created by phosphors excited by a plasma discharge between two flat panels of glass. Plasma displays use twice as much power as a comparable CRT television and were much heavier than the LCD screens.

None of these three technologies was perfect or easily scalable. Which is why the imaging industry in recent months is frantically dusting a technology that two scientists at Kodak first demonstrated in 1987: generating light with certain organic crystals, which had the property of electroluminescence. In other words, they brightened when excited by a jolt of electricity. However the very high excitation voltage requiring more than 100 volts −− inhibited commercial development for many years. Today it has morphed into the Organic Light Emitting Diode (OLED) −− an electronic device made by placing a series of organic thin films between two conductors.

When electrical current is applied, a bright light is emitted. OLED technology produces self−luminous displays that, unlike LCDs, do not require backlighting. These properties result in thin, very compact displays. The displays also have a wide viewing angle, up to 160 degrees and require very little power: between 2 and 10 volts.

Like LCDs, OLEDS come