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# **“LCD TV Matters”**

**Volume 2, Issue 4**



***"A Great TV in Every Room"***

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## Chairman's Corner: SID'09...

by Bruce Berkoff

Well the economic "tsunami" continues to have its repercussions globally throughout the world, while LCD TV unit growth continues almost unabated as a "green shoot" all its own. (Some temporary Q2 concerns of inventory build-up – notwithstanding, it's clear that many folks in the USA at least were willing to give up their vacations to buy a new LCD TV for the home, and programs like China's CE incentive were also leading to record LCD TV shipments and growth). While many new features (like ambient light sensing, as currently high-lighted in our "Green TV" logo program) and LED back and edge lighting are gaining prominence for their ability to help reduce energy consumption and/or improve image quality performance are also helping to ignite renewed interest and growth in LCD TVs of all sizes, the switch to digital and HDTV global seems to be progressing (and the USA "switchover" going relatively well has surely helped),

Of course, the new thinner and ever more beautiful set "designs" are helping as well, with greater "WAF" (or the wife acceptance factor we have been talking about related to LCDs for a decade now).

These new sets are really something to see, with better industrial design elements, image quality, and energy usage. It seems that LCD TVs are just now hitting full stride in beginning to look so good people stop comparing them to other "technologies," but only to each other (and no one seems surprised at unit growth, just at how affordable the bigger and newer sets are becoming).

In fact, an astute friend from Corning pointed out that this is the first SID he can remember where he saw NO PLASMA displays on the show floor at all, just LCDs everywhere. While I have to admit we do not have a complete show "audit." I think this may be the first show without PDP's on the floor since they were introduced as a common booth item well more than a decade ago. Does anyone else have any data on this topic they might want to share?



*"Large and wide "TV" displays on top of buildings in Japan have been common for years , like this image being watched by sculptures on a Tokyo rooftop, but now new ever larger and thinner works of art like this LGE LED LCD TV are available for your home.*

We believe unit growth for LCD TVs this year will easily be in the 15-20% range, as people still flock to new LCD TV sets globally in USA, China, and Europe etc., and as we always said, it is both easier and cheaper for those in the BRIC and VISTA countries to add a new LCD TV to their home than indoor plumbing, and many will in the years ahead (with arguably greater ROI!)

Still, the global economic downturn remains something to be concerned about, and for that we can all turn to our favorite economic forecast, bank report, local house of worship, or retail stores for comfort and support.



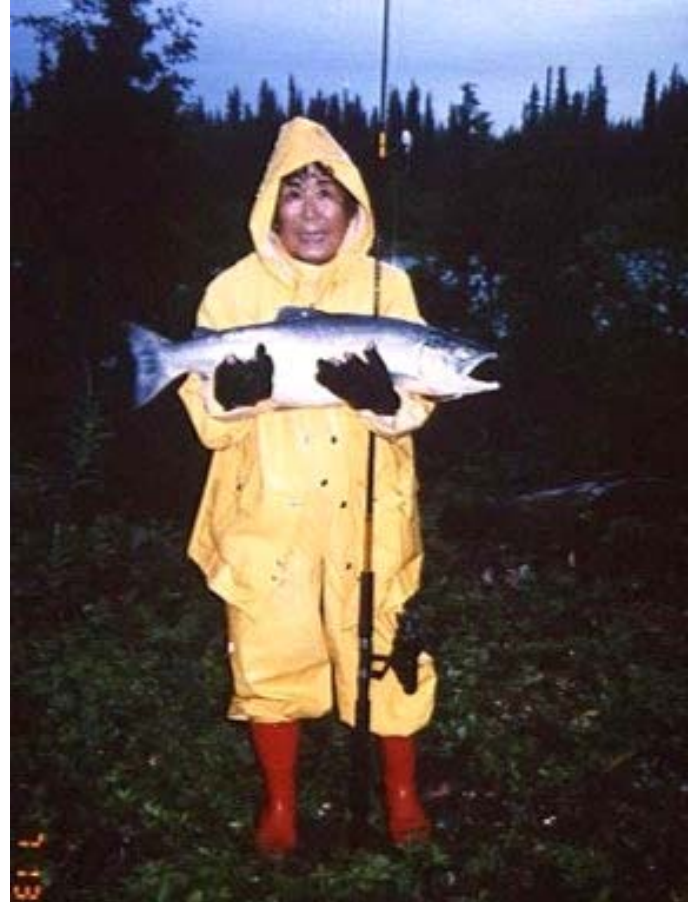
*From the Asian supply chain for LCDs we turn to the Asian supply chain of good wishes with these “incense burning prayer urns” common in Buddhist temples in various Asian countries and this large Buddha stature from Kamakura Japan.*

We also believe the “green shoots” we see all over the economy are especially prolific in the LCD industry and will turn to real recovery (even spot shortages?) as we see a strong 2H’09 globally, relative to 2H’08 for sure, and then continued recovery and growth into 2010.

Again, we are deeply impressed by not only the enduring spirit of the LCD TV consumer but the creative depths of the LCD TV engineers with even better sets and electronics and designs at more affordable prices.

Some folks have been shocked at so many new LED backlit or edge lit LCD TV models hitting the show floor, but we think their positive impact on design, image quality and energy conservation made them inevitable (though many have been concerned with one Korean company’s promotion of “LED TVs” to the point of hiding the fact that they are indeed LCD TVs, just with new and improved light sources, even to the point where we here anecdotally of Best Buy store representatives incorrectly telling customers these are “not LCD TVs” but actually “LED TVs” when of course this is not the case.

We are sure this will change as they become more common and understood). But today’s LCD TVs with great viewing angles, fast MPRT (motion picture response time), regional dimming for great contrast, blacks and energy savings and thin new “high WAF “ designs are barely recognizable from their early counterparts of 5 years ago.



*From a young girl in a B&W image on the left, to the same woman in full color years later on the right, it is often hard to imagine the changes time and technology will lead to, but all things progress and in LCD TVs the progression and maturity is becoming truly remarkable.*

Mr. Berkoff is the chairman of the LCD TV Association, a global not-for-profit marketing trade association dedicated to “informing, promoting, improving and connecting” the entire LCD TV supply chain and their related companies, to help promote “a great LCD TV in every room in the house!” For over six years, residing in Seoul, Korea, Mr. Berkoff was also the executive vice president of marketing and chief marketing officer (CMO) for LG.Philips LCD. He has also been the CEO of a fabless semi start-up in the video processing space and general manager of Philips Flat Display Systems software and electronics business unit. Prior executive positions also include UMAX Computer Corporation, Radius, SuperMac Technologies and ZD Labs. Mr. Berkoff is a visionary speaker and author in the display and electronics industry. He has display related patents both granted and pending in the USA and China. He holds an undergraduate degree in physics from Princeton and a graduate degree in biophysics from the University of California Berkeley. Mr. Berkoff has sat on the boards of at least five publicly traded companies, and currently sits on the BOD of LG Display (LPL), and Unipixel (UNXL).



# LCD TV News


compiled by Veritas et Visus

## Adobe plans to bring Flash to the TV

Flash was once known primarily as the technology behind those niggling Web ads in the 1990s that gyrated and flickered on the screen. Today, it is a ubiquitous but behind-the-scenes Web format used to display Facebook applications, interactive ads and, most notably, the video on sites like YouTube and Hulu. Now Adobe Systems, which owns the technology and sells the tools to create and distribute it, plans to extend Flash to the television screen. He expects TVs and set-top boxes that support the Flash format to start selling later this year. According to Adobe, Flash is now on 98 percent of all computers, and about 80 percent of Web videos are viewed using it. Adobe says Flash was installed on 40 percent of cell-phones shipped last year, and it recently announced efforts to increase that penetration by abolishing the licensing fees it was charging handset makers, much as it offers the Flash player free to consumers and video sites like YouTube. Some major players in the phone market do not support Flash. Most notably, Apple, maker of the iPhone, says Flash uses too much processing and battery power. Despite its problems wooing Apple, Adobe considers the television screen the last great frontier for Flash. To support the new effort to bring Flash to the TV, it has signed partners including Intel, Comcast, Netflix and Broadcom. While television makers like Sony and Samsung are not involved yet, analysts say integrating Flash – or at least some kind of Internet video – into the living room television seems inevitable. <http://www.adobe.com>

*One company standing in Adobe's way is Microsoft. Its rival to Flash, called Silverlight, is used by Netflix and the BBC, among others. Microsoft says the second version of Silverlight has been installed on 300 million PCs since it became available six months ago. It also claims that Silverlight better supports 1080p resolution, which is paramount to bringing Internet content to large HDTVs.*

## DiiVA Consortium opens up details of new digital interface specification

The DiiVA Consortium announced that the initial draft of the group's proposed digital home networking specification will be made available for public comment.  DiiVA (Digital Interactive Interface for Video & Audio) is a new consumer electronics (CE) home networking interface standard which combines the transmission of uncompressed video and audio with a reliable, high-speed, bi-directional data channel. With a maximum bandwidth of 13.5Gbps link speed for video, uncompressed video can be sent through the network from any DiiVA-enabled source to any DiiVA-enabled display. The bi-directional data channel is capable of simultaneously sending multiple protocols such as high-definition audio, USB, Ethernet, commands and content protection. The DiiVA Consortium's public web site (<http://www.diiiva.org>) outlines the process to gain access to the specification. A company must first register with the DiiVA Promoters group. Once a company has registered, it will obtain access to review the current draft of the specification. Feedback on the specification can be submitted to the DiiVA Promoters Group. Additionally, the DiiVA Promoters Group announced the formation of the DiiVA Steering Committee of Contributors, which includes leading system-on-chip (SOC) companies, Japanese and Korean CE companies, cable and connector makers and test equipment vendors. These companies will contribute and advise on the technical writing of the specification and assist the consortium to create value added features for end users.

## Motorola and Time Warner Cable deliver the industry's first "tru2way" multi-room DVR solution

Motorola announced that the company has teamed with Time Warner Cable Inc. to develop a multi-room digital video recorder (DVR) solution using Motorola tru2way set-top software. The Follow Me TV solution will enable subscribers to access, share and place shift video recordings throughout the home. Time Warner Cable aims to bring the solution to market later this year, to become the first cable company to deploy a multi-room DVR solution in a tru2way environment. The new tru2way application highlights the potential for place-shifting video of all types using a technology based on open standards. Motorola developed the whole-home DVR solution to work with tru2way software and the Motorola DCX3400-M and Motorola DCX3200-M tru2way-enabled set-tops. Using MoCA (Multimedia over Coaxial Alliance) technology, the solution creates a multimedia network using existing coaxial cable in consumer homes. The network is capable of transporting HD video, high-quality digital voice, and high-speed data to TVs, DVRs, game consoles, wireless access points, and PCs. <http://www.motorola.com>

**Sarnoff introduces products for ATSC Mobile DTV Standard compliance verification**

Sarnoff Corporation announced that it will introduce new product capabilities for testing and validating compliance with the ATSC Mobile DTV Standard. The development of the ATSC Mobile DTV Standard will enable broadcast delivery of digital television transmissions to mobile and handheld devices. Sarnoff's portfolio of testing tools quickly identifies and eliminates performance issues, giving users the ability to comply with the ATSC standard and offer innovative broadcasting methods to customers. Sarnoff offers capabilities for ATSC Mobile DTV Standard compliance in these products: Bitstreams designed to evaluate and identify potential problems in compliant decoders, Sarnoff's Bitstreams offer stress and error tests to ensure adequate performance, robustness and error resilience for mobile devices; Visualizer Digital Test Pattern is available in both compressed and uncompressed versions, and is re-rendered to allow visual evaluation of encoders and decoders use in the native mobile format; ESP Encoder Stress Pattern – Sarnoff's specialized and complex artificial test patterns stress various aspects of processing to force failure modes, allowing users to visually evaluate how well an ATSC-compliant encoder performs. <http://www.sarnoff.com>

**HDMI certifies first maglock cable**

The HDMI licensing body just certified a HDMI cable by Torrent, Inc. It has a built in diagnostic light and locking connectors. It has a built in diagnostic light. If you plug in one end, the cable end blinks if the connection is OK. Plug in the other end, it blinks if that local connection is OK, then goes solid if it can talk to the other end. It turns it off a minute after power up. It also has a magnetic locking mechanism. HDMI didn't put a locking mechanism into their standards, so each manufacturer is free to do what they like, with compatibility problems. The end of the cable has a sleeve magnet which when plugged in, the magnet is glued to the TV. <http://www.torrent-inc.com>

**Gefen wireless HDMI extender sends HDTV up to 10 meters**

Connectivity solutions provider Gefen announced its UWB (ultra wideband) wireless for HDMI extender is shipping. Ideal for ceiling mounted displays, outside applications and any room where extension cables are unwanted, the extender sends hi-definition resolutions to 1080p (24fps) and 5.1 surround sound up to 10 meters (33 feet) with no cables required. The sender/receiver system sets up simply, and is compatible with all audio/video sources using the HDMI format including Blu-ray players, gaming consoles, set-top boxes and more. The sender unit supplies two HDMI inputs and a third input for component video with two-channel audio. All three sources deliver video in the HDMI format with the stereo audio passed through in the same two-channel format. Both sender and receiver are powered to drive the wireless signal transmission. With CEC (Consumer Electronic Control) support, WiMedia Alliance compliance and FCC certification, the Gefen wireless for HDMI extender is a high performance solution perfect for eliminating wiring in small venues and single room HDTV applications. <http://www.gefen.com>

**Celeno Communications to launch HD WiFi this summer**

A Cisco-backed Israeli startup is saying in-home WiFi networks robust enough to deliver multiple high-definition television (HDTV) streams are now in field trials and will be hitting the market this summer. Celeno Communications manufactures the semiconductors for multimedia WiFi home networking applications and has created technology that upgrades the transmission portion of the WiFi network but will work with existing receivers such as set-top boxes already deployed. Celeno's technology would be built into broadband access gateways, and while the company has not yet identified its equipment partners, Cisco is expected to top the list. By making wireless home networks capable of delivering multiple HD streams, the Celeno technology would enable consumers to stream video from the PCs to TV sets and other consumer electronics devices, delivering on a significant portion of the anywhere, anytime video promise. Celeno's OptimizAIR technology uses 5 GHz spectrum, not the 2.4 GHz spectrum used by today's WiFi data networks. OptimizAIR uses standard PHY and MAC layers but adds proprietary algorithms that the company says can double the throughput of standard 802.11 WiFi and increase the range of the signals as much as eight times. Celeno's technology additions include Spatial Channel Awareness and Beam-Forming MIMO (multiple inputs, multiple outputs). The company said it can stream HD video 120 feet, through four brick walls and more than three floors. <http://www.celeno.com>

### **D-Link now shipping next-generation kit to expand home networks**

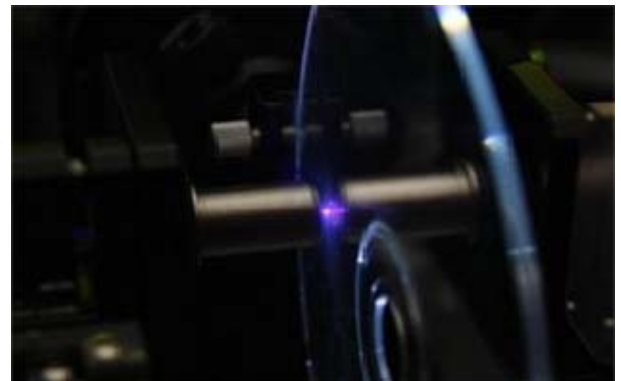
D-Link introduced its next-generation PowerLine adapter kit, a solution for connecting computers, high-definition (HD) media players, game consoles, network attached storage (NAS), and Internet content throughout the home. With the new D-Link PowerLine HD Ethernet Adapter Starter Kit (DHP-303) anyone can take advantage of existing home electrical wiring to create or extend a network. The kit includes two PowerLine wall plugs/adapters. The DHP-303 turns every power outlet in the home into a wall-to-wall network for connecting when connected to a switch or wireless access point. With simple plug-and-play installation, the DHP-303 is ideal for connecting an Ethernet-enabled digital media device such as TiVo or Slingbox to the home network and the Internet. It also allows users to connect gaming consoles like the Xbox 360, Playstation 3 or Nintendo Wii to the Internet. The device will automatically be displayed in Microsoft Windows Vista's Network Map. Users also can check the DHP-303's performance via a built-in LED. <http://www.dlink.com>

### **Warner to support China Blue HD format**

Warner Bros. has decided to release some of its films in CBHD, a Chinese high-definition disc format that has so far failed to compete with Blu-ray. If other studios join Warner, perhaps the format war isn't over. Blu-ray already vanquished HD DVD to become the single physical HD format. Now China Blue HD (CBHD) is now in the game, at least in China. The format got a boost from a Warner Bros. announcement that it plans to support CBHD with a number of its films during the first half of 2009, including Harry Potter titles and Blood Diamond. The studio hopes that its decision will extend its reach to more than 70 million Chinese homes by 2011. The main appeal of CBHD discs and players are that they are cheap to make. OMNERIC, the organization behind CBHD, says that converting a DVD production line to CBHD only costs \$800,000, compared to the \$3 million (or so) that it would cost to convert to a Blu-ray production plant. Combine that with low licensing fees, and you have discs and players that are more affordable to the typical Chinese customer than Blu-ray.

### **GE breakthrough validates technology to enable 500-gigabyte disc**

GE Global Research announced a major breakthrough in the development of next generation optical storage technology. GE researchers have successfully demonstrated a threshold micro-holographic storage material that can support 500 gigabytes of storage capacity in a standard DVD-size disc. This is equal to the capacity of 20 single-layer Blu-ray discs, 100 DVDs or the hard drive for a large desktop computer. GE's micro-holographic discs will be able to be read and recorded on systems very similar to a typical Blu-ray or DVD player. Holographic storage is different from today's optical storage formats like DVDs and Blu-ray discs. DVDs and Blu-ray discs store information only on the surface of the disc; holographic storage technology uses the entire volume of the disc material. Holograms, or three-dimensional patterns that represent bits of information, are written into the disc and can then be read out. Although GE's holographic storage technology represents a breakthrough in capacity, the hardware and formats are so similar to current optical storage technology that the micro-holographic players will enable consumers to play back their CDs, DVDs and BDs. The GE team successfully recorded micro-holographic marks approaching one percent reflectivity with a diameter of approximately one micron. When using standard DVD or Blu-ray disc optics, the scaled down marks will have sufficient reflectivity to enable over 500GB of capacity. <http://www.ge.com/research>



*Overlapping blue lasers recording holograms in a GE micro-holographic disc. GE researchers have demonstrated a threshold micro-holographic storage material that can enable the storage of over 500 gigabytes in a standard DVD-size disc, equal to the capacity of 20 single-layer Blu-ray discs, 100 DVDs or the hard drive for a large desktop computer.*

### **Philips sells its remaining stake in LG Display for €630 million**

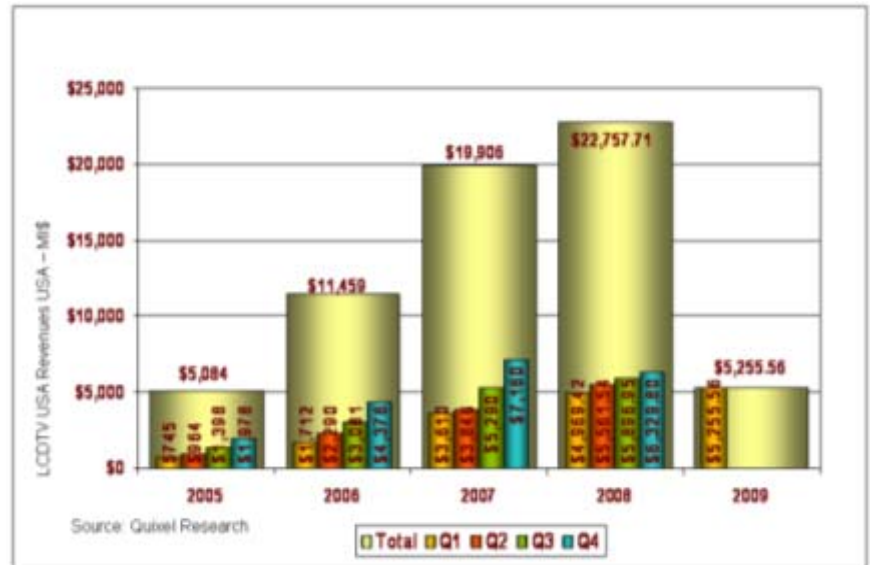
Royal Philips Electronics announced it has sold its remaining stake in LG Display to investors in a capital markets transaction. This transaction represents 13.2% of LG Display's issued share capital, or 47.2 million of common stock, and reduces Philips' holding to zero. The transaction will provide Philips with net proceeds of approximately €630 million, and is expected to result in a non-taxable gain of approximately €70 million in the first quarter of 2009, which will be recognized in financial income and expenses. <http://www.philips.com>



### Quixel Research publishes LCD TV market review

Quixel Research's recently published LCD TV Market Review revealed that the overall LCD TV market grew 39% in units compared to Q1'08 results. "It was quite an impressive show of the category's overall strength," stated Tamaryn Pratt, Quixel Research's principal. "It appears that with or without significant disposable income, consumers will still open their wallets specifically for LCD TVs. It was the only, mainstream display technology to post overall growth in either volume or value year-to-year." Revenues for the LCD TV category were \$5.2B in Q1'09 or up 6% compared to Q1'08 results of \$4.9B. Fast falling ASPs during the past 12 months, especially in larger screen sized models, capped growth for the category. Due to seasonal factors, Q1 2009 quarterly results showed the LCD TV category down 15% in units compared to Q4'08. Values for Q1'09 declined 17% quarter-to-quarter when compared to Q4'08 revenues of \$6.3B. Quixel Research's projections for the USA PDP market in units show category sales flattening in 2009 but revenues continuing to decline. Connected LCD TVs, or sets with some Internet, widget or RSS functionality, were another bright spot for the category in Q1'09, kicking off 2009 with a stellar quarter-to-quarter unit increase of 9%. Quixel Research's projections for the USA LCD TV market in units show the category increasing out to 2012.

<http://www.quixelresearch.com>



### IEEE establishes P1680.3 Working Group for environmental assessment of televisions

The IEEE has established a consortium that includes retailers like Best Buy and Wal-Mart and manufacturers like Panasonic and Sony, as well as the Environmental Protection Agency, the Natural Resources Defense Council and 70 other large enterprises, who have come together to create a voluntary labeling system that will let consumers know, for example, how much lead, mercury and toxic flame retardants their televisions contain. The labeling system goes far beyond the Energy Star imprimatur, which simply designates electronic products as being energy efficient. TVs carrying the new rating system will hit retail shelves in 18 to 24 months. Because the new rating system won't come into effect until late 2010 at the earliest, the label won't be available to the millions of digital TVs likely to be sold in the next 18 months, as consumers swap out analog sets for digital TVs. The rating system will be modeled after EPEAT. Reportedly, the group narrowly voted to create the new standard – with stiff resistance coming from TV brands, according to several members. <http://grouper.ieee.org/groups/1680/1680.3/>



### LCD TV Association members reinforce their commitment to green LCD TVs

Member companies of the LCD TV Association (LTA), a global, not-for-profit, marketing trade association formed to help the entire LCD supply chain, retail channel and consumers, today reinforced their commitment to usher in an era of greener TVs. The LTA's GreenTV logo program was launched last year in an effort to help focus LCD TV manufacturers and brands on reducing the power consumption of LCD TVs and raising consumer awareness of this important issue. The program currently aims to work with major TV vendors to implement and promote ambient light sensors, which will automatically lower the set brightness in a dark room by decreasing power to the backlight, thus saving energy and actually reducing potential eyestrain as well. This can reduce power consumption by at least 30%, and as much as 60%, in current implementations. Program participants are awarded the right to use the LTA's unique GreenTV logo on products, packaging, marketing and advertising material to help consumers identify these specifically enabled featured sets. Earlier this year, the group announced that a major global TV manufacturer has recently begun shipping TVs which qualify for its GreenTV logo usage, becoming the inaugural company to do this. <http://www.LCDTVAssociation.Org>



### California Energy Commission studies TV power consumption

While flat panel LCD displays comprise the majority of the TV market, traditional CRT TVs are still sold in some stores, marketed towards budget shoppers, as are energy-hungry plasma sets, marketed as luxury items. The California Energy Commission has now proposed a new set of standards that could go into place sometime between 2011 to 2013. The new legislation would not only place standards on TV sales, but would also govern digital video recorders, DVD players, and cable boxes' power consumption. The new rules will be voted on this summer. <http://www.energy.ca.gov/2008publications/CEC-400-2008-028/CEC-400-2008-028-SD.PDF>).

### DisplaySearch reports TV IC market competition as fierce as ever

While the flat panel TV market is beginning to consolidate, that process has not yet begun in TV chip manufacturing, according to analysis in DisplaySearch's Q1'09 Quarterly TV Electronics Report. Competition is as fierce as ever, and no clear market leader has yet emerged. While some consolidation occurred in 2008 with Broadcom's acquisition of AMD's TV business and ST Micro's purchase of Genesis, this has only kept pace with market expansion. As flat panel TV moves from being a product of the developed world to being the new normal in China, Eastern Europe and other middle income areas, it has created new market niches. Micronas' announcement that it is exiting consumer semiconductors signals a new phase. Because the downturn is causing semiconductor vendors to reappraise activities, the huge investments in TV ICs and their risky returns will cause more companies to make hard decisions. The TV IC market declined seasonally to 30 million units shipped into flat panel TVs in Q4'08. This was down 15.3% Q/Q, but up 3.5% Y/Y. Developed markets have completed their transition to flat panel TV, and growth in this segment is now being driven by China as LCD TV enters a rapid growth phase, replacing CRT TV. In Q4'08, Mediatek lost share again, down 3%. MStar increased share from 13% to 15% in Q4'08, propelled by strong positions in low-end sets from Samsung and LG. MStar is also strong in China. Samsung gained share as their in-house customer continues to grow in the TV market. Q4'08 also saw a sharp increase in shipments from smaller IC vendors, driven by a surge in production by Chinese set makers serving their domestic market typically with lower-featured (such as non-MPEG) devices. <http://www.displaysearch.com>

Top five TV IC vendors		
Vendor	Q4'08 Rank	Q3'08 Rank
Mediatek	1	1
MStar	2	2
Samsung	3	3
Zoran	4	5
NXP Semiconductors	5	7

### In-Stat predicts 802.11n Wi-Fi technology will dominate wireless HD video market

802.11n Wi-Fi technology will dominate the wireless HD video market, at least for the next several years, reports In-Stat. Three other technologies are competing in this space: Wireless Home Digital Interface (WHDI), WirelessHD, and Ultrawideband (UWB). However, the ubiquity of Wi-Fi technology is proving unstoppable. "802.11n is the next generation of the immensely popular Wi-Fi family. It promises data rates above 100Mbps and is backwards compatible," says Brian O'Rourke, In-Stat analyst.

"The installed base of Wi-Fi is immense, and effectively includes all mobile PCs, many mobile phones and a wide variety of CE devices. The primary drawback to 802.11n is expense, since it requires codec technology on both ends to transmit HD video. Neither of its primary competitors, WHDI and WirelessHD, requires codecs."

Recent research by In-Stat found the following: UWB will not be a major factor in the consumer electronics market. Many chip companies are leaving the market in late 2008 and 2009. Nearly 24 million digital TVs will ship with some type of Wireless HD video technology in 2013. WHDI and WirelessHD are being promoted by startups, but they are new, expensive, and power-hungry, which is generally not a recipe for quick market success. WHDI and WirelessHD will see a slow start, with fewer than 8 million devices with those technologies shipped in 2013. The research, "Wireless HD Video Technologies 2009: WHDI, WirelessHD, 802.11n, and UWB All Test the Waters" covers the worldwide market for wireless HD video technology. It includes: Wireless HD video capability by product segment, technology type, and chip average selling price forecasts to 2013; analysis of the markets by technology and by product segment; a rundown of silicon competitors: Alereon, AMIMON, Broadcom, Celeno, General Atomics, Pulse~LINK, Quantenna, Radiospire Networks, Realtek, SiBeam, Sigma Designs, and Tzero Technologies. <http://www.in-stat.com>

### Sony announces 200Hz Bravia Z5500

Sony has unveiled the Bravia Z5500 with Sony's Motionflow 200Hz and Image Blur Reduction technology, claiming a Full HD experience. Motionflow 200Hz calculates three additional frames for every original, upping the frame rate from 50 to 200 per second while the Image Blur Reduction "cleans" the original frames before new frame insertion for sharper images. The Z5500 features BRAVIA Engine 3, is DNLA-certified, Bravia Sync ready and offers "AppliCast" that, thanks to the TV's Ethernet port and Internet connection, can display RSS feeds and widgets on screen. It has green features such as an "Energy Saving Switch", auto-shut-off and "Idle TV" mode and is available in three screen sizes: 40 inch, 46 inch and 52 inch. It is due late June in the UK, and is expected to be priced at around £1800. <http://www.sonystyle.co.uk>



### ROHM announces ambient light sensor ICs for LCD display backlighting

ROHM Semiconductor announced a new family of analog and digital ambient light sensor (ALS) ICs for the efficient control of LED backlighting for LCD-equipped devices. Featuring ROHM's proprietary trimming process and use of multiple photodiodes with different junction depths, the ALS ICs provide an accurate output with little variation between various light sources. The spectral response of ROHM ALS ICs has been tailored to closely match that of the human eye for accurate light measurement. These features combine to provide uniform visibility for LCDs over a wide range of ambient light levels and sources – from incandescent or fluorescent light to full sunlight. <http://www.rohmsemiconductor.com/als.html>

### Sharp launches "green" DH77 series LCD televisions

Sharp announced the new AQUOS DH77 series, the latest addition to its range of full HD LCD TVs with 100-Hz technology. The DH77 series will be available in 32-inch, 42-inch, 46-inch and 52-inch sizes. A notable feature of the new TVs is the "green eco-button" on the remote control that Sharp says lets viewers reduce the energy consumption of the TV. This eco-control button lets viewers directly operate the "Energy Save Mode" without having to navigate the menus. This decreases power consumption while the TV is being watched, while the "Optical Picture Control" further reduces power consumption by automatically adjusting the backlight brightness according to lighting in the room. The LCD TVs in the DH77 range come with a 50,000:1 contrast ratio, Sharp's "Natural Clear Panel", three HDMI inputs and a USB port. <http://www.sharp.com>

### NHK exhibits 33-megapixel 3D display

The Science & Technical Research Laboratories (STRL) of Japan Broadcasting Corp (NHK) revealed details about an ultra-high definition TV with a resolution of 7,680x4,320 (approximately 33 megapixels). STRL exhibited



*The 33-megapixel integral 3D display. The resolution of the 21-inch model is equivalent to 400x250.*

the Ultra-High Definition TV last year and the years before. But this is the first time that the company showcased a 33-megapixel TV. The prototype is composed of four 4K x 2K panels in addition to a large projection TV. The company demonstrated a live broadcast of the landscape in Sapporo City, Hokkaido, in Japan by compressing data into a 100Mbps H.264 video stream with the use of IP transmission and a satellite. The 21-inch 3D TV was realized by using a lens array that covers an ultra-high definition panel. In addition to the use of the true ultra-high definition display, STRL reduced the lens array pitch to 1.34mm.

### DisplaySearch reports that global TV revenues declined 12% Y/Y in Q1'09

With a lingering global recession continuing to place pressure on discretionary spending, global TV shipments declined 6% Y/Y in Q1'09 to 43.3M units according to the latest Quarterly Global TV Shipment and Forecast Report from DisplaySearch. This was a decline of 25% from Q4'08 on seasonal trends. Revenues fell even more, down 12% Y/Y to \$22.1 billion with ASPs falling 6% Y/Y as both retailers and brands sought to keep consumers shopping. The resulting shipments were very close to projections, but the mix was weighted more heavily towards LCD TVs than expected on strong demand in China as well as North America. Globally, flat panel TV shares grew from 66% in Q4'08 to 68% in Q1'09 as LCD TV prices fell even more in Q1'09 on an annual basis than they did during the Q4'08 holiday season, an indication of the pressure to maintain consumer demand.

LCD TVs were the only technology to gain share during the quarter, rising from 58% to 62%, as Y/Y shipments grew 27% to 26.7M units, but revenues posted the first ever Y/Y decline on a worldwide basis, down 1% Y/Y, highlighting the pressure on prices. Plasma TV unit shipments increased 1% Y/Y by comparison to 2.8M with revenues falling by 26%Y/Y, representing 6% of unit shipments and 11% of global TV revenues. China remained the #1 region for TV shipments, increasing unit share from 19.1% to 21.3%, with strong growth in LCD TV shipments, posting the only sequential increase in LCD TV unit volume from Q4'08 to Q1'09 of any region, as the rural subsidy program gained momentum and helped to partially offset a sharp decline in demand for CRT TVs. North America was the dominant region for TV revenues, accounting for >27% of global dollars due to a greater mix of large size LCD and plasma TVs than other regions. Global TV shipment performance by technology can be seen in the top table.

Q1'09 worldwide TV shipments by technology (000s)				
Technology	Q1'09 Units	Q1'09 Unit Share	Q/Q Growth	Y/Y Growth
LCD TV	26,749	61.8%	-20%	27%
PDP TV	2,792	6.4%	-37%	1%
OLED TV	1	0.0%	17%	-45%
CRT TV	13,690	31.6%	-30%	-38%
RPTV	66	0.2%	-42%	-33%
<b>Total</b>	<b>43,298</b>	<b>100%</b>	<b>-25%</b>	<b>-6%</b>

Q1'09 worldwide TV brand rankings by revenue share					
Rank	Brand	Q4'08 Share	Q1'09 Share	Q/Q Growth	Y/Y Growth
1	Samsung	22.1%	21.5%	-29%	-8%
2	LGE	11.5%	13.3%	-16%	2%
3	Sony	14.8%	13.1%	-36%	-9%
4	Sharp	7.4%	7.2%	-29%	-12%
5	Panasonic	8.8%	6.1%	-50%	-22%
	Other	35.6%	38.8%	-21%	-17%
	Total	100.0%	100.0%	-27%	-12%

On a brand basis, Samsung remained the global brand share leader in revenues for the thirteenth straight quarter, holding their revenue share around 22%, and also leading in global TV unit share. LGE overtook Sony for the #2 share position in global TV revenues, rising almost 2 points to 13.3% and posting the only Y/Y revenue growth among the top five brands with a 14% Y/Y growth in unit volume. Sony fell to #3 on a revenue basis as a result, with Sharp and Panasonic rounding out the top five. It's interesting to note that in LCD TV on a revenue basis, Philips fell out of the top five for the first time, replaced by Toshiba who was #2 in Japan and #5 in North America and Western Europe. <http://www.displaysearch.com>

### Large-area TFT LCD shipments grew 6% in April, highest in seven months, says DisplaySearch

April 2009 shipments of large-area TFT LCD panels reached 40.1 million units, showing strong M/M growth of 6%, according to the most recent DisplaySearch monthly TFT LCD shipment database. The 3% Y/Y increase in shipments marked the first time in seven months that there was positive Y/Y growth in monthly shipments. However, revenues were 39% lower than April 2008, indicating the magnitude of price declines over the past year. Large-area TFT LCD revenues did increase 6% M/M, reaching \$4.2 billion. As DisplaySearch reported previously, the February shipment results indicated the TFT LCD industry had reached the bottom of the cycle, and then March results showed some recovery. April shipment results indicate a continuation of the large area TFT LCD industry's recovery. All three major applications – notebook PC, monitor and TV – showed M/M growth. DisplaySearch's research found that notebook PC panels had the highest M/M growth at 9%, followed by TV panels at 8% and monitor panels at 3%. However, monitor panel shipments are still lower than the same month last year. Notebook panel shipments were 9% higher than the same month last year and TV panels were 8% higher than April 2008. The Table shows monthly shipments by application.

Monthly large-area TFT LCD panel shipments and growth (millions)					
	Apr 08	Mar 09	Apr 09	M/M	Y/Y
Notebook PC	11.7	11.6	12.7	9%	9%
Monitor	18.2	15.4	15.8	3%	-13%
TV	8.2	9.9	10.7	8%	30%
Other	0.9	0.9	0.9	-	-%
<b>L/A Total</b>	<b>39.0</b>	<b>37.9</b>	<b>40.1</b>	<b>6%</b>	<b>3%</b>

For the notebook PC application, shipments of 16:9 aspect ratio panels reached 3.6 million, 28% of the 12.7 million notebook panels shipped, up from 24% in March. Meanwhile, shipments of 15.6-inch (16:9) notebook panels reached the same level as 15.4-inch (16:10) panels. In monitors, 16:9 panels reached 6.1 million units, a 38% share of the 15.8 million monitor panels shipped, up from 28% in March. Meanwhile, 32-inch TV panel shipments reached 4 million units in April, and 42-inch TV panel shipments passed 1 million units for the first time since last October. <http://www.displaysearch.com>

### DisplaySearch reports that large-area TFT LCD shipments fell 3% Q/Q in Q1'09 to 91.5M units

Results of the DisplaySearch large-area (10 inch and larger) TFT LCD survey for Q1'09, as reported in its Quarterly Large-Area TFT LCD Shipment Report, indicate that shipments reached 91.5 million units, a decline of 3% Q/Q and 18% Y/Y (see Table 1). Due to the decline in shipments, large-area TFT LCD revenues fell 17% Q/Q and 52% Y/Y, to \$10 billion. Slow market demand in Q1'09 led to reductions in capacity utilization across all applications.

**Table 1: Q1'09 large-area TFT LCD shipments by original specification and application (millions)**

	Application	Q4'08 Shipments	Q1'09 Shipments	Q/Q Growth	Y/Y Growth
LCD Monitor	LCD Monitor	33.8	35.0	4%	-25%
	LCD TV	1.7	1.9	8%	-34%
Notebook PC	Notebook PC	28.2	22.9	-19%	-30%
	Mini-Note	2.7	4.2	57%	N/A
LCD TV	LCD TV	24.8	24.6	-1%	-3%
Others	Others	2.6	2.8	9%	-26%
<b>Total</b>		<b>93.8</b>	<b>91.5</b>	<b>-3%</b>	<b>-18%</b>

DisplaySearch also revealed details of its survey of panel makers' shipment targets for Q2'09 through Q1'10. Panel makers are increasing capacity utilization to respond to growing demand and targeting Q2'09 shipments of large-area TFT LCD panels of 125 million, up 37% from Q1'09 (see Table 2). If panel makers reach their unit shipment targets, revenue growth is expected to be 47% Q/Q.

	Application	Q1'09 Shipments	Q2'09 Shipments	Q/Q Growth
LCD Monitor	LCD Monitor	35.0	46.3	32%
	LCD TV	1.9	3.0	61%
Notebook PC	Notebook PC	22.9	30.9	35%
	Mini-Note	4.2	7.8	86%
LCD TV	LCD TV	24.6	34.2	39%
Others	Others	2.8	2.7	-5%
<b>Total</b>		<b>91.4</b>	<b>125.0</b>	<b>37%</b>

In Q1'09, Samsung Electronics ranked #1 in large-area TFT LCD panel revenues, with sales of \$2.9 billion, a 28.7% revenue share, according to DisplaySearch findings. LG Display was #2, with \$2.5 billion in revenues and a 25.4% sales share. CMO was ranked #3 at \$1.4 billion with a 14.4% share. In Q1'09, Samsung also took first place in units and area shipments. LG Display and CMO were second and third, respectively. Korea was the largest supplier of large-area TFT LCD panels in Q1'09 with 52.2%, while Taiwan's share remained unchanged from Q4'08, at 38%. Table 3 shows the Q1'09 shipment ranking of large-area TFT LCD panels by original specification and application. <http://www.displaysearch.com>

Rank	Notebook PC	Mini-Note	LCD Monitor	LCD TV	Others	Total
1	LG Display	HannStar	Samsung	LG Display	Sharp	Samsung
2	Samsung	AUO	LG Display	Samsung	AUO	LG Display
3	AUO	CPT	CMO	CMO	LG Display	CMO

#### **Nielsen reports that 1.3% of country still without digital one month after DTV switch**

According to Nielsen, 1.5 million TV households, or 1.3% of the country, were unready for DTV as of July 12, a month after the June 12 transition date. That is down 200,000 households from the 1.7 million households that weren't ready two weeks before, according to the latest Nielsen figures. Nielsen defines unready as homes that rely on over-the-air TV and don't have a digital TV set or a DTV-to-analog set-top converter hooked up.

#### **IPIC acquires NOVA Chemicals**

International Petroleum Investment Company and NOVA Chemicals announced the completion of the acquisition of NOVA Chemicals by way of a plan of arrangement. NOVA Chemicals will continue to operate its chemicals and plastics business from its North American base. Pursuant to the Arrangement, IPIC acquired all of NOVA Chemicals outstanding shares for \$6.00 per share. <http://www.ipic.ae> <http://www.novachemicals.com>.

#### **Uni-Pixel Displays joins the Center for Advanced Microelectronics Manufacturing**

Uni-Pixel announced that it has joined the Center for Advanced Microelectronics Manufacturing (CAMM) at Binghamton University, State University of New York. Supporting the CAMM's mission to demonstrate the feasibility of roll-to-roll (R2R) flexible electronics manufacturing, UniPixel will leverage its recent grant from the FlexTech Alliance to further advance its R2R Conductor Patterning Capabilities that it has developed for its Opacity Active Layer Films. <http://www.unipixel.com>

#### **Wal-Mart to create eco-ratings for products**

Wal-Mart Stores plans to demand that all its suppliers measure the environmental cost of making their products so Wal-Mart can calculate and post an eco-rating for each item. In the program's first phase, Wal-Mart will be asking its suppliers to answer about 12 questions about such topics as water use, according to Jay Golden, a professor in the Global Institute of Sustainability at Arizona State University and co-director of the consortium of about 12 universities working with Wal-Mart on gathering scientific data and setting new design standards. The next phase involves creating a database and metrics for sustainability, and the third is to translate that information into a ratings system consumers can understand. <http://www.walmart.com>

### DisplaySearch expects double and quadruple frame rate penetration to reach 19% of LCD TV panels

Double frame rate (also known as 100Hz/120Hz) and quadruple frame rate (also known as 200Hz/240Hz) LCD TV panels are rapidly taking important positions in LCD TV panel makers' product roadmaps and shipment plans.

DisplaySearch reports that 2009 shipments of 100Hz/120Hz and 200Hz/240Hz LCD TV panels will reach 22.5 million units and 4.8 million units, respectively, accounting for 15.8% and 3.4%, respectively, of the total 142 million units panel makers are targeting, according to the company's latest "Quarterly Double Frame Rate TV Panel Shipment & Forecast Report". In Q1'09, shipments of double frame rate LCD TV panels reached 3.5 million units, achieving a 14.3% penetration. Samsung led shipments with a 33.7% share, followed by AUO at 18.3% and LG Display, Sharp, CMO and IPS-Alpha. Currently, only

	100 Hz/120 Hz	200 Hz/240 Hz
Samsung	33.7%	92.3%
AUO	18.3%	
LG Display	17.3%	7.7%
Sharp	15.7%	
CMO	9.9%	
IPS-Alpha	4.6%	

Samsung and LG Display are mass producing 200Hz/240Hz LCD TV panels, with Samsung holding a dominant 92.3% market share in Q1'09, as shown in *Table 1*. Some quadruple frame rate panels use blinking backlighting technology to simulate quadruple picture performance. 40-inch is the largest segment with a 25% share of double frame panels, 46 inch is #2 with 18%, and 32 inch is #3 with 14%. Quadruple frame rate panel shipments mostly focused on 40, 46 and 52 inch. *Table 2* shows the double frame rate LCD TV panels shipment sizes, shares, penetrations as well as the main panel suppliers. DisplaySearch's forecast for the segment shows that in Q4'09, the

	Share	Penetration	Top Three Makers
32"	14.3%	5.1%	AUO, Sharp, IPS-Alpha
37"	13.7%	22.6%	AUO, Sharp, LG Display
40"	25.1%	39.6%	Samsung, CMO, AUO
42"	14.7%	23.1%	LG Display, CMO, Sharp
46"	17.8%	51.0%	Samsung, AUO, Sharp
47"	4.5%	36.4%	LG Display, CMO
52"	5.1%	39.0%	Samsung, Sharp
55"	4.2%	91.2%	LG Display, Samsung, CMO
65"	0.5%	91.8%	Sharp
70"+	0.01%	100%	Samsung
<b>Total</b>	<b>100%</b>	<b>14.3%</b>	

penetration of double frame rate and quadruple frame rate will reach 17.1% and 4.2%, respectively, and in Q1'10 penetration will increase to 19.5% and 5.3%, as LCD TV panel makers are aggressively developing upgraded refresh rate panels for additional value. <http://www.displaysearch.com>

### CableLabs issues request for information on 3D TV

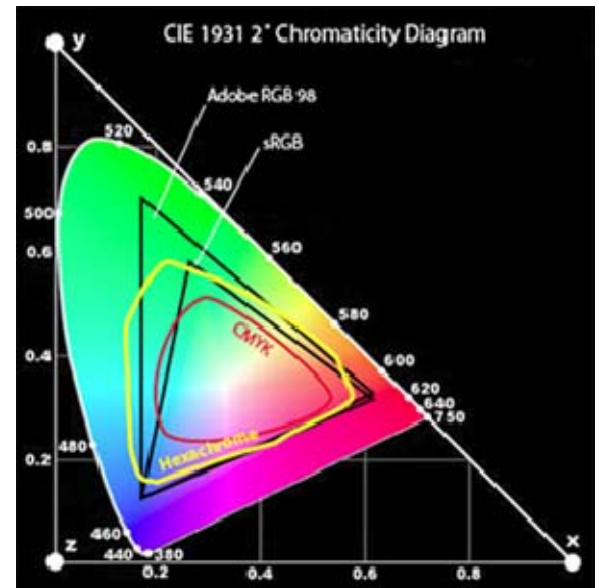
CableLabs issued a request for information to about a dozen 3D video technology companies in late March, as the industry consortium is looking to ahead of the issues involved in delivering three-dimensional TV programming. David Broberg, CableLabs vice president of consumer video technology, said the organization will evaluate different 3D TV systems and produce a report for its member MSOs. He added that as part of the RFI process CableLabs will assess operator requirements to understand better what the operators want out of a 3D TV system. Broberg last month was appointed to chair the Society of Cable Telecommunications Engineers' ad-hoc working group on 3D TV, which is tasked with identifying any needed changes to existing SCTE standards, including transport protocols, to facilitate the provision of 3D content by cable operators. Standardization work in for delivering 3D television is in the early stages. For example, the Society of Motion Picture and Television Engineers last summer established a task force to define the parameters of a mastering standard for 3D home video. There are more than 30 different methods for multiplexing left and right images into a video stream. Some approaches send the left and right images in alternating frames; others send the images side-by-side in the same frame - both of which would reduce overall picture quality. Another technique is color multiplexing, which uses color filters to separate the left and right sides. Because the standards haven't been established, it isn't clear whether the conversion to 3D will be made in the set-top or in the display. <http://www.cablelabs.com>

### Displaybank brings out LED LCD TV makers' roadmap and market forecast

The history of LED LCD TV is explored in this report and finds that Sony firstly launched 40-inch and 46-inch products in 2004. Afterwards, Samsung Electronics launched 40-inch in 2006 and 40-, 46-, 52-, 57-, and 70-inch products in 2007. LG Electronics launched a 47-inch product in 2008 as well. Sony and Samsung Electronics continuously strengthened the LED LCD TV line-up and have been pioneering the LED LCD TV market the most aggressively among the major TV makers. However, it is found that LG Electronics are now active and many other makers also plan product launches. Major TV makers like Sharp, Philips, Panasonic, and Hitachi are expected to secure line-ups within 2009 and some brands that show strong trends in limited regions also plan to launch distribution type LED LCD TV products. <http://www.displaybank.com>

### Sharp to increase color gamut of its LCDs

Sharp plans to boost the subset of the colors the human eye can see by adding additional colored subpixels to the standard red, green, and blue. The company has developed a new LCD panel that uses five primary colors instead of the standard three primaries of red, green, and blue. The full 1920x1080 pixel panel is said to cover 99% of the Pointer "real world" color space and should far exceed that of the standard RGB color space used in current LCD models, even those that claim to cover the AdobeRGB color space. The RGB color model attempts to come close to matching our eyes' sensitivity to primarily red, green, and blue wavelengths. But for various reasons, sRGB or even AdobeRGB standards still don't encompass all the possible colors we can perceive. Various methods have been employed in the past to extend the range of possible color reproduction, particularly in printing, where the standard CMYK printing inks have been enhanced with the addition of red, green, blue, and/or orange inks – such as in some Epson ink sets or Pantone's Hexachrome six-color printing standard. Further, attempts have been made to record more faithful images by adding additional color filters to the standard RGB pattern used in digital cameras. Sharp's new LCD panel takes this same idea and applies it to displaying colors on a screen. The company's new design adds cyan and yellow to the standard red, green, and blue subpixels found in other LCDs. This allows the display to reproduce nearly the color defined by the Pointer color space, a standard based on measurements of real world inks, paints, and pigments. Sharp claims this makes images displayed on the device "identical in appearance to real-world objects". Such a display should improve the appearance of things like brass, rose petals, and skin tones, which many displays have a hard time reproducing accurately. Without any modification, it should easily improve most video sources, and with proper color profiling could also be a great monitor for photographers. But adding additional subpixels could play havoc with the text anti-aliasing used by Mac OS X and Windows, so it might not make for a practical monitor until some serious custom drivers are available. Sharp is planning on commercializing the product soon, it says.



*The diagram compares the gamuts of sRGB, AdobeRGB, CMYK, and Hexachrome to the CIE color space*

### ViewSonic unveils Full HD 1080p 22.0-inch LCD HDTV

ViewSonic Corp. launched the VT2230, the newest addition to its LCD TV line. The VT2230 is a 22.0-inch LCD HDTV that supports Full HD 1080p resolutions. The TV is an ideal addition to a kitchen, den, bedroom or any room in the home needing a small screen HDTV. The VT2230 has an MSRP of \$349 and is available immediately. High brightness combines with an 8,000:1 dynamic contrast ratio. The integrated ATSC/NTSC/QAM television tuner and multiple connectivity options, including HDMI, allow multiple uses of the product, such as gaming in Full HD using Xbox, PlayStation, and Wii computer consoles. The product also complies with DVD and HD Blu-ray players. These connections provide users with superior picture quality while having the versatility to use on a desktop or in the game room. The VT2230 has a 16:9 aspect ratio and a native 1920x1080 resolution panel. <http://www.viewsonic.com>

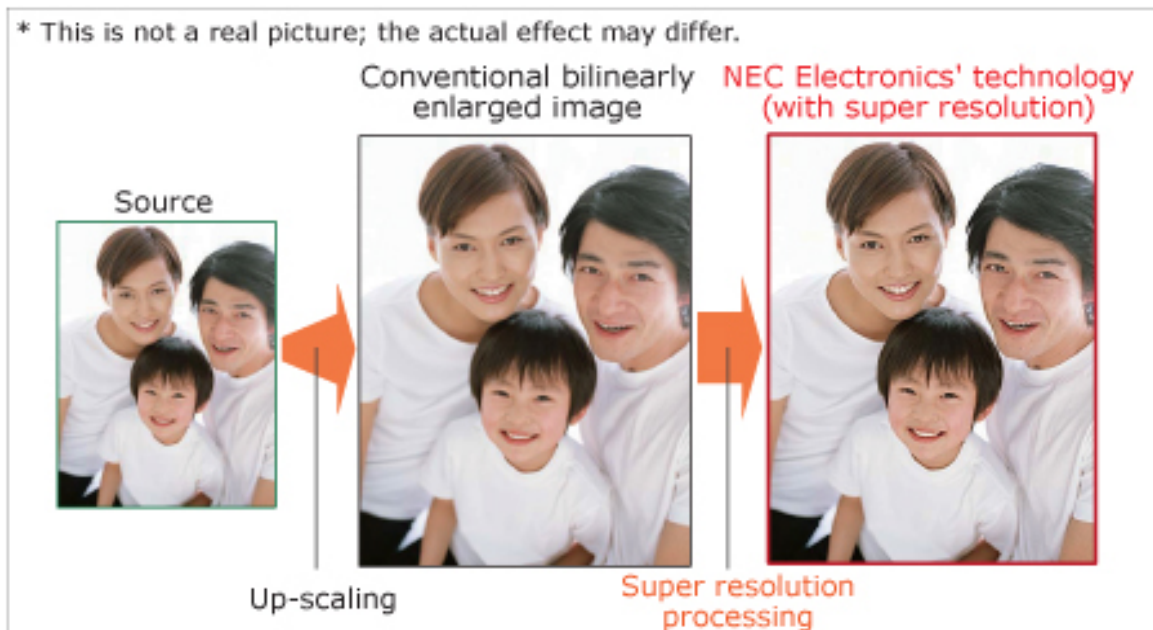


### NEC Electronics introduces super-resolution ASSP to sharpen Full HD image and video quality

NEC Electronics announced its new super-resolution application-specific standard product (ASSP), the  $\mu$ PD9280GM, which can reduce blurring that occurs when low-resolution images and video are expanded and displayed in 1920x1080 pixel high-definition (HD) monitors. Based on the company's, single-frame super-resolution technology, the new ASSP achieves crisp images in HD TV broadcasts by boosting 720x480 pixel standard definition (SD) image data. It is also capable of supporting one billion colors (30-bit color depths), which enhances color vividness and accuracy of display. The rapid development of today's high-performance digital audio/visual (AV) devices, such as mobile phones and digital TVs, has left consumers with the challenge of how to view low-resolution images on their new high-definition electronic products. For example, 1920x1080 pixel HD televisions have six times the resolution compared to the 720x480-pixel SD image data, which results in blurred images. Although many image-enhancement technologies have been developed to process low-resolution image data into full HD images, designers, using traditional solutions, need large-capacity external memory devices and high-performance computing engines, and face other challenges to achieve real-time processing for vivid moving images. To solve these problems, NEC Electronics and NEC Central Research Laboratories jointly developed a new technology that enables very high-resolution processing with just one frame of image data. In November 2008, NEC Electronics announced the first super-resolution ASSP (part number  $\mu$ PD9245GJ) for HD image processing, which has been gaining popularity in the market. To address the demand for full HD image processing, the company now offers the new  $\mu$ PD9280GM super-resolution ASSP. <http://www.am.necel.com>

### NEC introduces single-frame super resolution ASSP

NEC's new single-frame super resolution ASSP analyzes and processes image data on a single frame to improve low-quality images. Super resolution is a technology used to sharpen out-of-focus images that have been enlarged using a general up-scaling process (such as a bilinear or bi-cubic process), thereby delivering an image with high-quality resolution. Super Resolution can be used to improve the quality of low-resolution video and still images in a variety of applications. The technology features processing of image data using dedicated hardware, without external memory; real-time processing of moving images; and standard video interface. <http://www.am.necel.com>



### Sky says there could be 3D TV by Christmas in the UK

Sky subscribers could have 3D TV this Christmas, the broadcaster said. The firm's chief engineer, Chris Johns, said that there's the possibility that homes could see 3D by the end of the year and Sky is aiming to build a content library over this year. Sky has already successfully demonstrated 3D TV at its London HQ. 3D broadcasts will most likely be available through Sky's existing Sky+ HD platform, the company said. Viewers will have to buy a TV capable of displaying the stereoscopic images and special glasses to separate out the left and right-eye views.

### ASUS shows TV/monitor combos

ASUS unveiled its T1 series range of HDTVs that double as LCD monitors for computer use. Available in 22-, 24- and 27-inch sizes, each has a built-in TV tuner, letting viewers access digital DVB-T and analog PAL/SECAM programs in European markets. All have a 1080p resolution and sport two 7-watt speakers, with the signal arriving either through one of two HDMI ports, one of two SCART connections, and optical or RCA for audio. Regular video connections include one each of component, S-Video, RCA and VGA. ASUS claims dynamic contrast ratios of about 20,000:1. Brightness of all three is set at 300cd/m<sup>2</sup>, while viewing angles are 170 degrees off horizontal and 160 degrees off vertical. Screen response time is a 5ms. There are also preset video modes that include Scenery, Night View, Game and Standard and a built-in 2D/3D comb-filter, a noise reduction feature, 3D de-interlace, and 2:2/3:2 pull-down conversion to adapt sources to the native frame rate.



### LG brings out 55-inch 240Hz LCD TV with LED backlighting

LG introduced the 55LH90, a 240Hz LCD TV with LED backlighting. The 55-inch LCD TV uses 960 LEDs and features local dimming with 90 LED zones that are controlled to generate a claimed contrast ratio of more than 2,000,000:1. This is the first LCD TV to receive THX certification in South Korea. The solution is priced at KRW 6,400,000 (about US\$4760 based on today's currency rate).

### Sony debuts networked Bravia HDTVs

Sony Electronics announced a series of networked HDTV models. This new W-series models feature an Ethernet connection so the sets can directly access Sony BRAVIA Internet Video content using an existing broadband connection. The service offers one of the largest selections of free and premium movies, TV shows, sports, music and more from an array of partners like Amazon Video On Demand, YouTube, Yahoo!, Sony Pictures, Sony Music and many others. BRAVIA Internet Widgets, provided by the Yahoo! Widget Engine, expand and personalize the experience by allowing users to interact with favorite Internet content like Yahoo News, Video, Finance, and Flickr while watching TV shows. The 52-inch KDL-52W5100, 46-inch KDL-46W5100, and 40-inch KDL-40W5100 (diagonal) models feature Motionflow 120Hz technology for improved sharpness and detail in fast-moving images. They also feature Sony's BRAVIA Engine 3, which improves image quality. The W-series models are Digital Living Network Alliance (DLNA) compliant, enabling easy access to digital photos, music and video stored on a PC or other DLNA server using the XMB interface and the TV's remote control. They also offer a USB input for displaying digital photos or playing digital video and audio files from compatible USB storage devices. The new networked televisions are now available. <http://www.sonystyle.com>



*On the left is LG's new 55-inch 240Hz LCD TV featuring LED backlighting; on the right is Sony's newly introduced, networked 52-inch LCD TV with enhanced features to access the Internet.*



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# China Turns on the TV Demand

by Paul Gagnon

Paul Gagnon is director of North American TV Research at DisplaySearch. His 10 years of retail and manufacturing experience in the consumer electronics industry adds value and insight to DisplaySearch's leading industry analysis. At DisplaySearch, Gagnon calls upon his expertise in consumer purchasing behavior to provide in-depth analysis of US sell-through trends and sales forecasting. Before joining DisplaySearch, Gagnon served as a senior marketing analyst for Hitachi America LTD's Home Electronics Division. There, his responsibilities included the development and implementation of retail sales incentives as well as the forecasting and analysis of ever-changing TV and video market trends. Gagnon has also been a member of the CEA Video Division Market Research Committee.



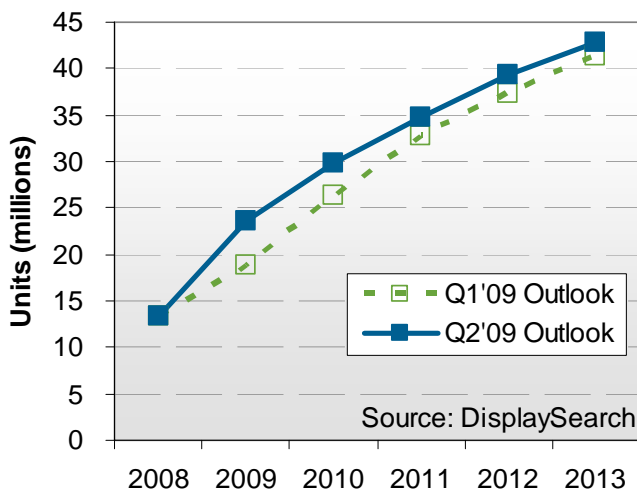
The LCD TV industry is in a state of extreme tension. Panel makers are seeing strong demand that, despite their best efforts, they can't seem to meet. At the same time, TV brands and retailers are concerned about getting adequate supply in the 3<sup>rd</sup> quarter AND rapidly rising panel prices. So much in the second half of 2009 depends on timing and negotiating power.

Yet, with developed economies still slogging through an economic recession and consumers facing just as many spending obstacles as 6 months ago, where is this surprising demand coming from? Certainly low prices are overcoming purchase barriers in many markets, but many are concerned that rising panel prices will so squeeze the set makers and retailers that prices may have to *increase* in the near term, especially in North America. So what is keeping panel makers busy?

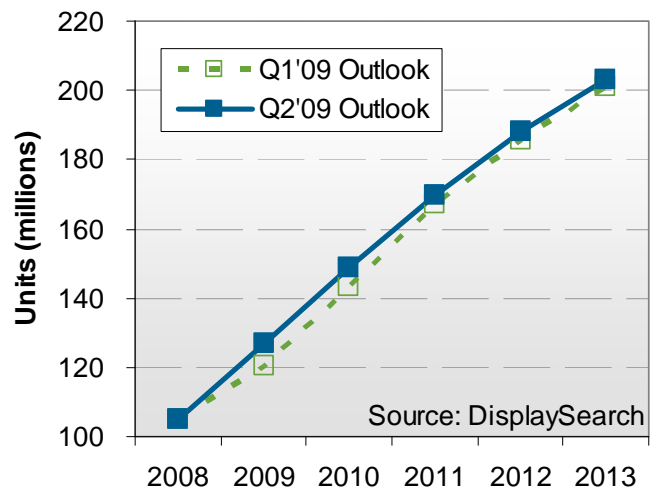
In a word: China.

Chinese demand is surging right now (at least for LCDs), partially due to natural technology replacement cycles as prices become affordable to larger populations, but also in response to government intervention.

### China LCD TV Demand Outlook



### Worldwide LCD TV Demand Outlook



The Chinese government started earlier this year, after a trial program in late 2008, by encouraging rural Chinese households to purchase home electronics, including TVs, by providing them with a 13% subsidy credit on sets with a ceiling price of CNY 2,000 (approximately US\$300). This program was met with guarded optimism by the LCD TV industry since the upper price limit was so low and the most of the qualifying models were small sizes and low profit. The program was expanded in April by raising the ceiling price of qualifying models to CNY 3,500



# Retail price survey of LCD TVs in Q2'09

## Price stabilized temporarily; more significant drop of small-sized LCD TV

by Tom Lo

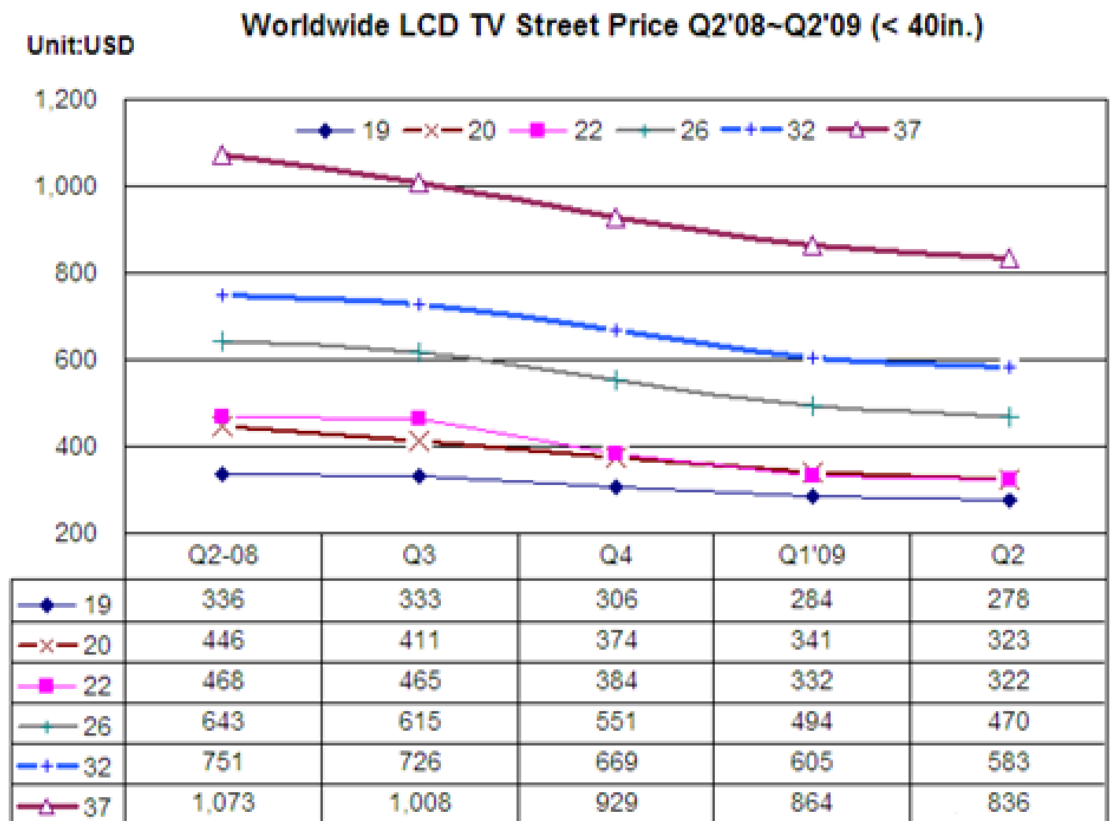
Tom Lo is a senior analyst at WitsView. His main research focuses on the LCD TV and LCD monitor industries. Before joining WitsView, Tom worked at *DigiTimes*, where he conducted DTV (digital TV) research. WitsView is a subsidiary brand of DRAMeXchange, which provides prompt and credible market insights covering the quantitative pricing trend for both TFT panels and finished goods, industry updates and market intelligence. <http://www.witsview.com>



According to WitsView's Q2'09 LCD TV street price survey, the rate of price drop has gradually slowed, especially among the large-sized models, slipping by only 1.8%. This is reflective of the panel price increase and the continuous launch premium models, which helped stabilize the average price of LCD TVs.

In terms of the small-sized LCD TVs, 20-inch was the victim that suffered the most severe drop, down by 5.5%. However, from our observation in May and June, the downward slope appeared to have softened. Prices for 19- and 22-inch TVs were cushioned by the rebound of panel prices, and only slipped by 2.1% and 3% respectively, the slightest drop for models below 40-inch. For the first time, prices for 32-inch fell below \$600, a 3.7% drop compared to \$583 in Q1'09. No notable price fluctuations were seen in the US and UK markets; but in Japan, due to the rapid replacement of new models, the price plummeted from \$906 in Q1'09 to \$776. Prices of last year's models from vendors such as Sharp, Hitachi, and Panasonic all plunged: for example, for Sharp 32GX4 (FHD+120Hz), the price was ¥131K in Q1, and it fell below ¥100K in Q2; Panasonic TH-32LZ85 (FHD+120Hz) also fell from ¥112K to ¥91K. As for China, influenced by the electronic product subsidy program, the 32-inch now stands at \$472, a whopping \$50 drop from last quarter.

For 37-inch, there are minimal changes in the US and UK market, this is partially due to new launches from LG and Panasonic. Prices for the 37-inch in China plunged from \$745 to \$650, making it the main culprit for the steep drop. Beginning Q2, China's electronic product subsidy program took effect; the scope of LCD TV price that qualify for subsidy extended from those priced at RMB2,000 and below to RMB 3,500. In terms of the current cost structure, 37-inch is the largest size qualified for the subsidy. Among the sizes that are eligible for the subsidy, almost all sizes fell by over 10%, (except for 32-inch with 9%).



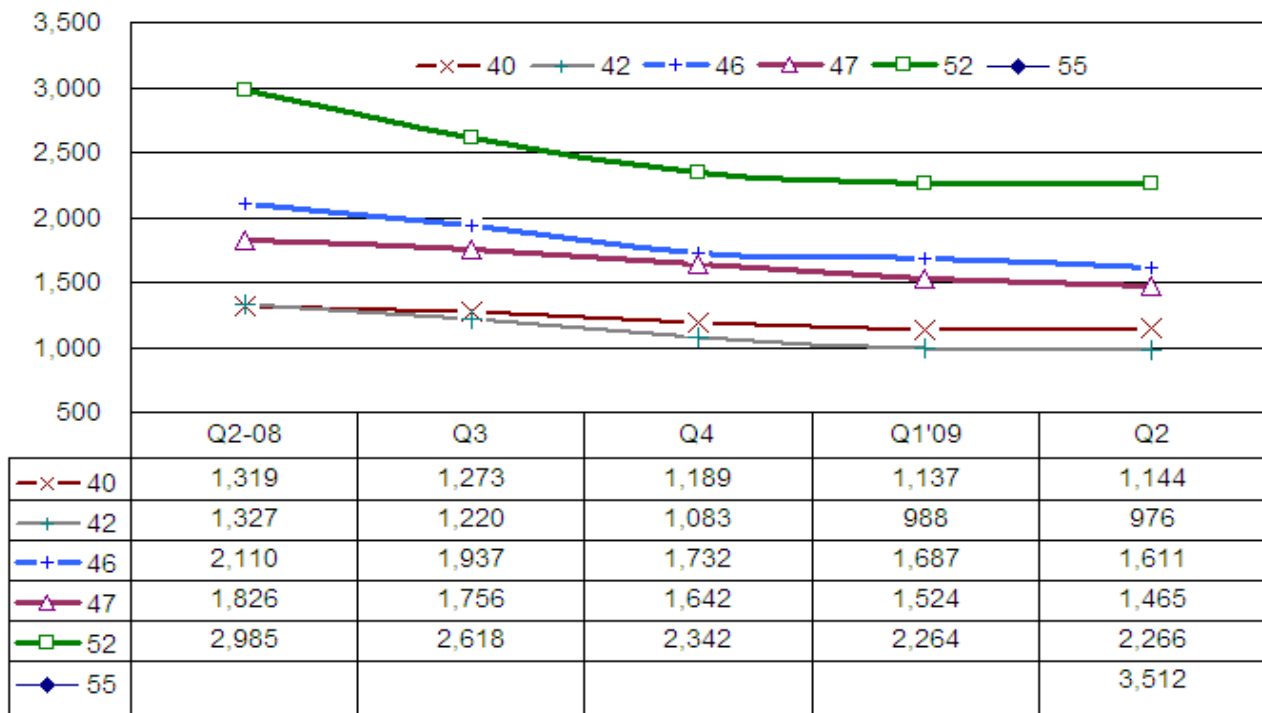
There were notable changes for 40/42-inch. In fact, 40-inch pricing increased by 0.7%, from \$1137 to \$1144; and 42-inch went down by 12%, from \$988 to \$976. Japan witnessed the sharpest drop in 40-inch, from \$1636 to \$1456, despite that the penetration of Double Frame Rate (DFR) has expanded from 75% to 100%. China remains the region that offers the lowest prices on 40/42-inch, but the respective drop of 4.8% and 5.6% is far less significant than smaller sized models at above 10%. This is mainly because the prices of 40/42-inch are still above the threshold of the subsidy.

46/47-inch decreased by 4.5% and 3.8% respectively, with the latter falling below \$1,500 for the first time. Generally speaking, average price for 46-inch is higher than that of 47-inch, however, the reason is different across various regions; in the US, 46-inch is only higher by \$45 because tier-one (46-inch) prices are within close range of tier-two (47-inch) prices; In Taiwan, however, there is a substantial difference of \$551-this is because tier-one vendors have opted to launch only the premium models of 46-inch. Japan is the only market where 47-inch is higher than 46-inch, reason being there are very few premium models of 47-inch left for sale. Hitachi and Toshiba may be the only vendors planning to launch 47-inch LCD TVs in the future.

Theoretically speaking, the larger the size, the bigger the room for a price drop. However, 52-inch maintained at \$2,266 in Q2, (\$2264 in Q1). Key markets have reflected stiff pricing. Japan was the only exception, with prices falling from \$3163 to \$2876. The 55-inch is included in the survey for the first time, priced at \$3512, at least 50% higher than its 52-inch counterpart. Notably, the most premium products among top-tier vendors are 55-inch, not 52-inch; for example, all of Samsung's LED-backlit LCD TVs are 55-inch, the 52-inch models are CCFL only.

Generally speaking, the aggregate price for Q2'09 dropped by 2.8% Q/Q, but the good news is that the rate of decrease has softened compared to the 7.5% drop in Q1'09 and 10.2% drop in Q4'08, reflecting the recent panel price rebound. Moreover, the 3.7% drop for 37W and below is far more significant than that of 40W, which slid by 1.8%. This indicates that there is more room for price drop in the small-sized TVs. The phenomenon can be explained by the level of sophistication of its models: since March this year, the new large-sized models launched were mostly premium models, securing the ASP of models above 40-inch. And since the small-sized segment is not the primary focus of TV makers, and there are relatively fewer premium models in this segment, its rate of decline is greater than that of the large-sized segment.

Unit:USD Worldwide LCD TV Street Price Q2'08~Q2'09 (>=40in.)



## Interview with William Wang of VIZIO

Born in Taipei, Taiwan, VIZIO's William Wang moved at age 12 to Hawaii where his family believed he could receive a better education. Two years later they moved to Southern California where family friends had found success in the real estate market. In California, William began his love of TV, with some of his favorite shows including "Charlie's Angels." Even though William voiced an interest in architecture, he entered USC and earned a degree in Electrical Engineering. After graduation, he took some graduate courses at Cal State Long Beach and left in order to pursue an



expanding role with a computer monitor company. With the PC business expanding rapidly, William quickly rose to a position heading up marketing and sales. Seeing an opportunity to build better monitors, he left to launch MAG Innovision and later purchased Princeton Graphic Systems. These brands became successful introducing many industry firsts in the CRT and later the LCD monitor business. With the PC and monitor business consolidating and maturing at the turn of the century, William decided to sell both companies. Knowing that the US government had mandated a conversion to digital TV and what it took to make an HDTV he saw that the market could grow if he made them affordable. He launched V, Inc., that later became VIZIO, Inc., at the end of 2002 with first products hitting Costco shelves in the second quarter of 2003. By forming close partnerships with retailers, component suppliers and ODMs, along with an industry leading operational efficiency, the brand was able to open the market to millions of Americans and became the #1 HDTV brand just four years later. Founder William Wang, now CEO/CTO is focused on formulating the next generation of TVs and making VIZIO the world's best consumer electronics brand.

**Please give us some background about VIZIO and how you came to be involved in the LCD TV market.** VIZIO's Founder and co-founders all have roots in the LCD monitor and HDTV business with the MAG Innovision and Princeton Graphics brands they ran previously. With their and key partner knowledge of what a TV consisted of, they saw an opportunity in 2002 to add efficiency and a new approach to the HDTV business. With this knowledge, combined with the US government's mandate to convert to a digital system, VIZIO set out make high performance HDTVs affordable for millions of Americans that would soon be demanding them.

**The major brand players all insist that huge investments, (at least many tens of millions of dollars), are required to establish a major consumer electronics brand presence. Given your experiences in bringing the VIZIO name to market, is this a fair claim?** At this point in time, after VIZIO's growth and the phase of the transition, that is probably a good assumption.

**VIZIO recently achieved the #1 position in the LCD TV market in the US. Is this success encouraging you to expand into other international markets?** Yes, we will expand where we see a place in the market for our brand.

**Perhaps this is perception, but it seems that a couple of years ago VIZIO lagged the market trend toward the 1920x1080 pixel format. Recently, however, VIZIO's product offering is dominantly comprised of FHD solutions – to the point of an industry leadership position at the higher resolution. Any comments?** With any new feature to not only become, but to find its way into a majority of our TVs, it must be of significant benefit to the consumer which can be delivered at a price that is better than they had expected.

**With regard to resolution, do you anticipate that 4K cinema will entice a move any time in the near future to enhanced resolutions such as 3840x2160 for the home cinema market?** It will, but hardware popularity and adoption always follow content availability.



*VIZIO's VA22LF is a 22-inch LCD TV at full-HD resolution of 1920x1080 pixels.*



**21:9 TVs will start shipping later this year in Europe. Do you foresee any interest in the 21:9 format in the US market and does VIZIO have any plans to support?** We will support 21:9.

**With regard to frame rate, the market is shifting rather rapidly from 60Hz to 120Hz. To what extent do you expect further shifts to 240Hz and beyond?** This will depend on the affordability of technology for 240Hz and beyond.

**We're certainly seeing expanded interest in 3D. Tell us about VIZIO's thoughts related to 3D TV, 3D gaming, and 3D home cinema.** Again if enough content becomes available to make 3D a demand application for TVs, it will be offered in the VIZIO line-up.

**With more and more homes putting 1920x1080 devices into their living rooms, the typical TV monitor now enables more information to be displayed on the screen than the typical desktop monitor. Do you think this phenomenon will hasten the convergence between CE and PC devices?** We have always offered VGA type inputs on our TVs and many VIZIO HDTVs are being used for computing and entertainment applications.

**Please tell us about your VIZIO Internet Apps.** VIA is our new technology platform that's all about innovation and disruption. It brings together the most advanced, compelling technologies that satisfy what the mass market is looking for. For the initial launch this fall, this means we'll be shipping our most advanced HDTV ever, with built-in WiFi, Bluetooth, universal remote with sliding keyboard, and a suite of content and services from the top brands on the Internet. Consumers will be able to watch movies and TV shows on demand, discover new music, celebrity playlists or radio channels, keep tabs on their Twitter or Facebook network, play games, and much more.



*VIA Connected HDTV sets will also come with a universal remote control which incorporates a QWERTY keyboard that slides open in order to allow viewers to type in whatever user names, passwords and keywords they need to enter in order to use their TV widgets.*

**What are your thoughts about the emergence of wireless connectivity solution for the HDTV market?** In developing our VIZIO Internet Apps TVs we believed that to give full access to any household's Internet connection we had to offer 802.11n with dual band performance.

**Are you planning to include build-in the wireless receiver into your TVs, or will this be an external option?** Built-in.

**"Green electronics" is certainly gaining traction in consumer electronics. What sort of things is VIZIO doing to assure the recycling and disposal of older CRT products that your new flat panels are replacing?** We have an e-waste take-back program in place with MRM that covers a significant number of states for VIZIO owners to take back their unwanted TVs to drop-off centers for recycled disposal with no cost to the owner. We are in discussions with MRM to expand the program nationwide.

**What sorts of things is VIZIO doing to help reduce the power consumption of your LCD TVs?** All VIZIO LCD TVs are 15% below Energy Star 3.0 requirements. Some of our models are over 30% more efficient than Energy Star 3.0. VIZIO is looking at a number of initiatives in TVs and in new models including the following:

- Using LED in some of our new models to replace fluorescent lamps for lighting in TVs
- Using special technology in our new models to dynamically control LED called "Smart Dimming" to improve picture quality and improve power consumptions
- Introducing new Surge Protectors that automatically turn off your TVs when you turn your TV off "Smart Surge"
- Using Ambient Light Sensors in some of our TVs to dim the TV in darker environments to save power
- Introducing a new Blu-ray player that meets Energy Star requirements

**Most market analysts have consistently under-forecasted the long-term growth of the LCD TV market. What's your view of market growth over the next couple of years?** It will be extremely exciting in the next few years where LCD is replacing every CRT in the world! You already see that happening in China!

**Currently, your biggest LCD TV measures 55-inches in diagonal. Do you expect to introduce even larger LCD TVs in your portfolio any time soon? Or has the move to ever-larger TVs finally reached an upper limit?** Yes we are. There is definitely more room to move up!

**Technology-wise, what are the areas that need the most attention to further improve the viewing experience, and what is VIZIO doing in these areas?** There are several things VIZIO is doing to improve the viewing experience on television today

- We are planning new models that use LED technology such as Smart Dimming which is ability to turn on and off LED-based on the darkness of the content to dramatically improve contrast ratio. We are branding this as TRULED.
- We are using special polarizers to allow consumers a better picture when viewing Televisions from an angle or off center
- We are making TVs faster so they can keep up the motion of the Television with 120hz and 240hz technologies
- We are making TVs that have a smoother picture using de-judder reduction techniques in which we call Smooth Motion
- We are now offering Blu-ray players with 1080p/high resolution and cleaner pictures for movie watching that can be purchased with our TVs



*VIZIO's VF551XVT, will be this fall, a 55-inch LCD TV to use local-dimming LED backlighting.*

**We've recently seen considerable publicity about a patent infringement claim made against VIZIO by Funai. Can you give us a summary of the situation and the current status as to what it all means for VIZIO?** We at VIZIO deeply respect the rights of intellectual property upheld by the US Patent and Trademark Office, which does not apply to this claim by Funai. Unfortunately, we are not immune to frivolous lawsuits and we reserve the right to defend ourselves of meritless claims at all times. The products involved with this particular claim are obsolete, and no longer in mass production. Therefore we believe this action will not impact our ability to conduct our business in normal fashion. VIZIO continues to move aggressively on all possible avenues to protect its rights and its own intellectual property.

**Similarly, VIZIO recently filed an infringement lawsuit against LG Electronics. What's that about?** We do not comment about ongoing litigation. Again, VIZIO respects intellectual property and will defend itself accordingly.

**Who are your primary LCD suppliers?** LGD, AUO, CMO

**Considering that major players in the LCD TV industry (Samsung, Sharp, Sony, in particular) all have invested into LCD manufacturing facilities, are there any thoughts about VIZIO investing in LCD production capacity?** Not at this time. Our partnerships with current LCD suppliers are working out rather well.



*VIZIO is focused on a broad variety of improvements to the HDTV visual experience*

Introducing a Whole New World of Color



The All New VIZIO XVT Series TruLED HDTV



# Enabling greener displays/LCD TVs

by Werner Becker and Georg Bernatz

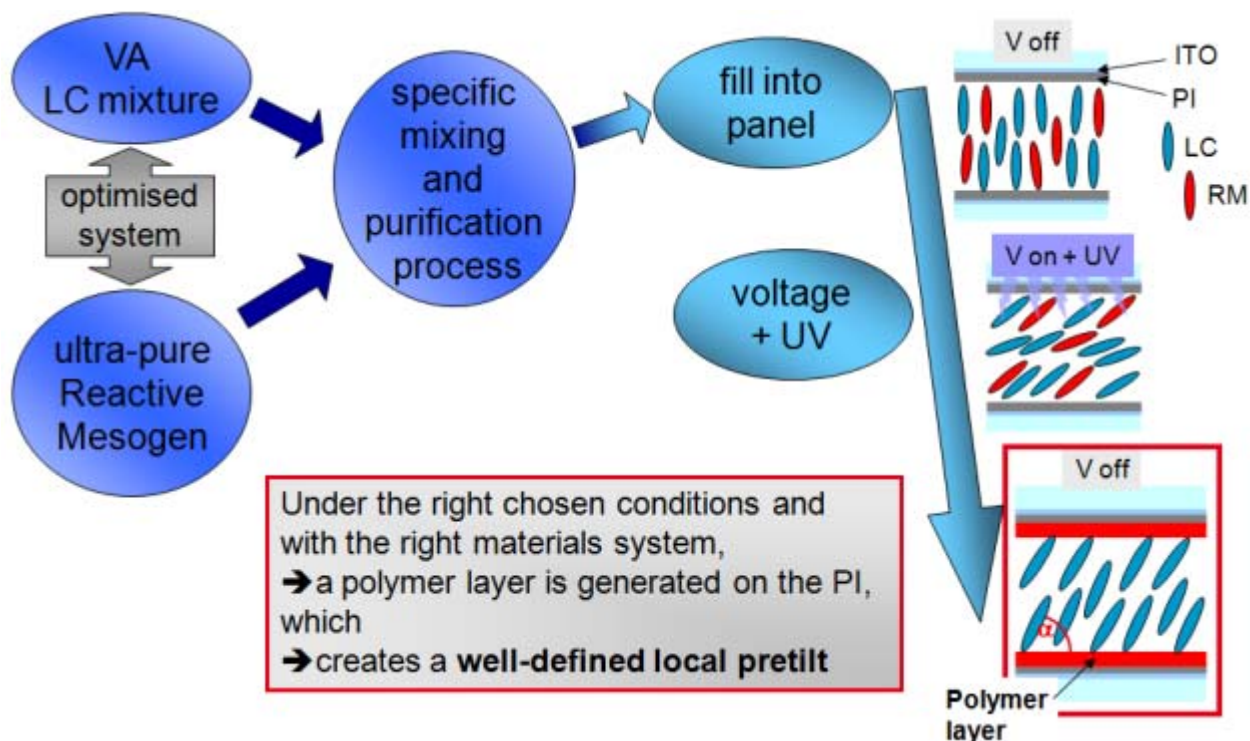
Werner Becker and George Bernatz represent Merck KGaA, Liquid Crystals Division, of Darmstadt, Germany. Merck is the world's leading manufacturer of high-tech display materials, in particular for LCD TVs, and strongly committed to sustainability and product stewardship. Merck does not use acutely toxic or mutagenic substances, only safe and legally compliant ones manufactured by highly efficient and environment-friendly processes. Together with customers Merck is also strongly involved in the development of new LCD technologies such as "PSVA" (Polymer Stabilized Vertical Alignment). This features a very much enhanced panel transmission thus enabling significantly lower backlight and consequently TV set power consumption for more eco-efficient hence "greener" LCDs. Moreover, Merck's display materials comply with laws concerning electronic equipment such as EU and Asian RoHS and voluntary self-restrictions like the Halogen-free initiative of the "High Density Packaging User Group". Additionally, Merck has developed two WEEE (Waste of Electrical and Electronic Equipment)-conformal LCD recovery processes that allow almost 100 % recovery and can run in existing industrial waste incineration and precious metal recycling plants.



## Merck's PS-VA mixtures – unique materials for unique LCD performance

Polymer Stabilized Vertical Alignment (PS-VA) is a novel Liquid Crystal Display (LCD) technology, which is related to VA technology, but with significant differences – not least the need for novel LC mixture formulations: in case of PS-VA, a polymerizable LC (= Reactive Mesogen) is the key component of the LC mixture. In the PS-VA process step at the panel manufacturer, the Reactive Mesogen is polymerized by UV light under application of a voltage to the LCD panel. For well-suited LC mixtures, display layout and process conditions, a local small deviation of the LC orientation from the vertical direction ("tilt") is generated, which can significantly enhance LCD performance:

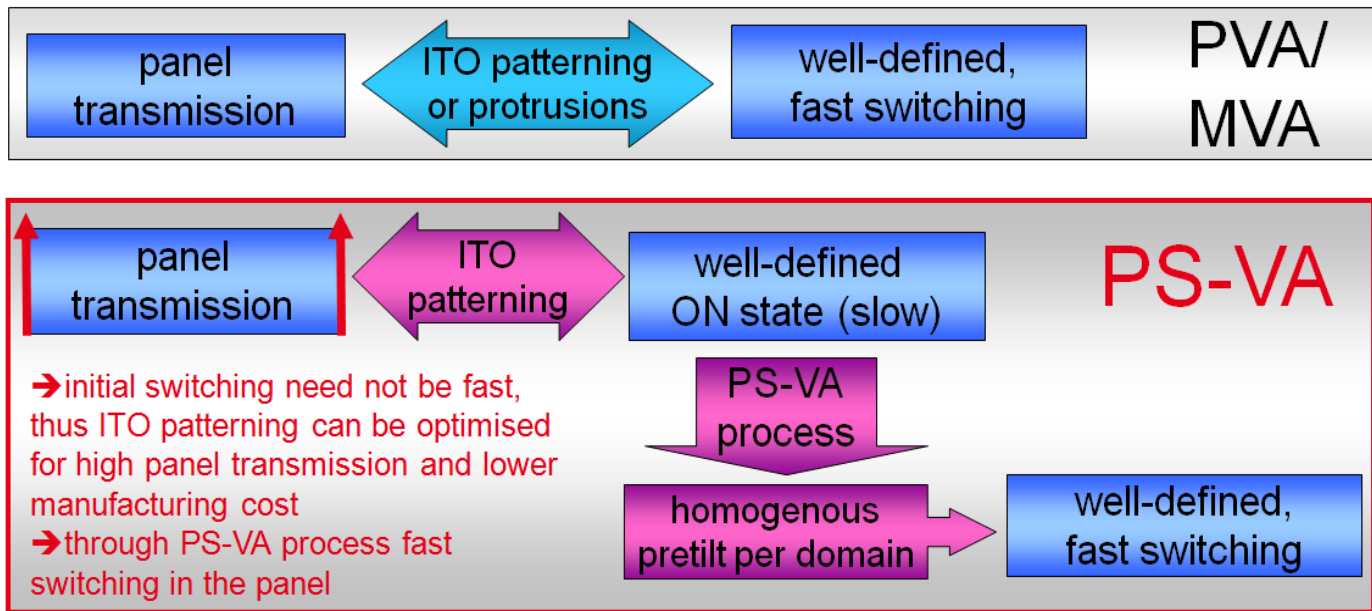
PS-VA displays boast very fast switching, very high contrast and high transmission, which can significantly reduce backlight power. This prolongs battery lifetime in mobile devices and reduces power consumption of TV sets – thus making those "greener". Lower backlight power, as well as the PS-VA specific LCD electrode layout, brings a cost benefit for the LCD maker. All these different advantages can be tuned to the application – be it mobile or TV.



PS-VA Concept

The display principle was developed already some years ago, and Merck was deeply involved in development of suitable materials from the beginning. Significant challenges had to be overcome both in the field of materials as well as LCD panels, and only quite recently PS-VA panels are entering the market in several applications. In all cases, specifically developed innovative materials from Merck were an important key to the success.

In the first commercial products, the flexibility of the PS-VA concept has clearly been used for the optimization of very different LCD performance parameters: ultimate resolution in mobile phones, high contrast and color saturation in portable gaming devices, and ultimate static contrast in TVs. The basic strength of PS-VA is the new degree of freedom it gives to LCD design and layout – thus allowing for totally new solutions beyond the standard LCD modes. Thus there is more to come, and Merck is very active in developing the materials for today's and future requirements.



*PS-VA gives new degrees of freedom in LCD layout; the VA-typical direct tradeoff between speed and panel transmission is decoupled by PS-VA*

PS-VA needs specific Reactive Mesogens, and Merck's long-running activities in Reactive Mesogens for optical compensation films have been an important basis for this development – both from physics as well as chemistry point of view. Due to the special interplay between Reactive Mesogen and LC mixture in the PS-VA process, an optimization of the total materials system is necessary. Still, the basis of any PS-VA mixture is a VA mixture, and from performance point of view, the better the VA mixture, the better, e.g. faster, is the PS-VA display. With Merck's unique position and decade-long expertise in VA LC mixtures, we can find the optimum overall solution.

From mixture production point of view, at first glance, PS-VA mixtures seem not that different from "classical" VA mixtures. But practically, incorporating a "tiny" amount of Reactive Mesogen into a LC mixture is not at all trivial, as modern TFT displays demand utmost purity of all materials. "Normal" LCs are basically inert, but due to the reactivity of the new component, special large-scale production processes and -equipment had to be developed, with minimized drawbacks in tact time and yield.

All in all, Merck is very well positioned to support and advance this trend-setting new LCD technology with our unique materials. PS-VA offers breakthrough performance for green LCD TVs.

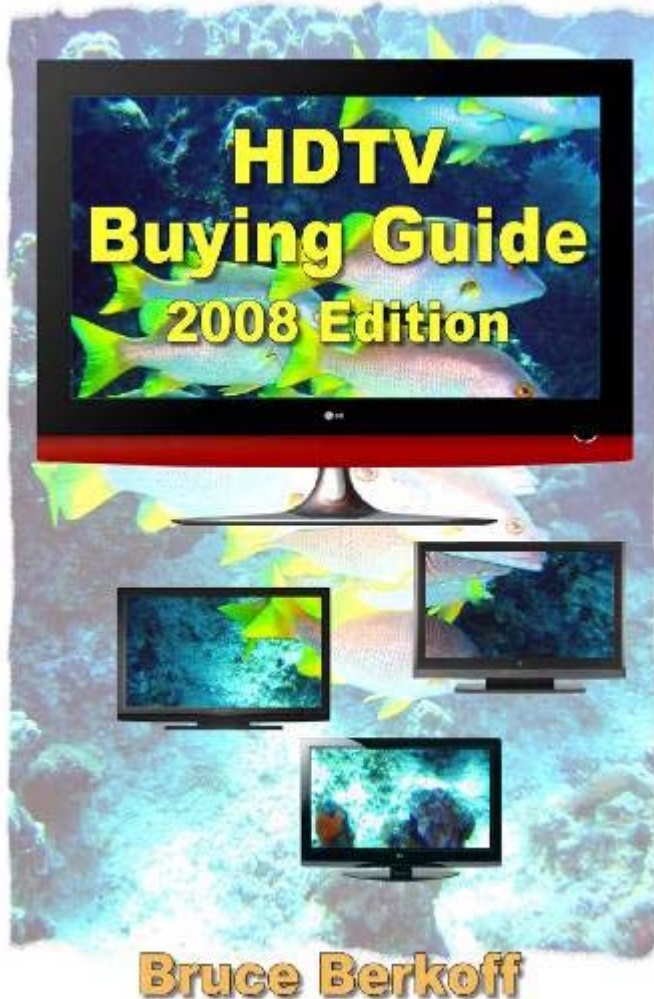


## 2008 HDTV Buying Guide released

Authored by Bruce Berkoff and edited by Alfred Poor, the 2008 edition of the HDTV Buying Guide is newly available. The 68-page paperback book can be ordered at Amazon for \$13.45, qualifies for free shipping status, and is available immediately: <http://www.amazon.com/HDTV-Buying-Guide-Bruce-Berkoff/dp/0965197530>

*"After an easy 2-hour read, I was off again to the electronics store to compare the seemingly endless choices of HDTV's. This time I knew the proper size and features of the LCD I wanted to buy for my living room and had a list of meaningful questions to ask the salesperson regarding price guarantee, warranty, and extras (cables and external speakers). The money saved on cables alone offset the cost of the book many times over. I especially found the "myth busting" boxes and "what to look for" paragraphs informative. The title of the book says it all...HDTV Buying Guide".*

-- P. Molisani



### HDTV Buying Guide

If you're ready to buy an HDTV, this book is all you need to understand the various choices and choose the right one.

*This book covers all the bases, but is so easy to understand that I'd give it to anyone in my family who wants to buy an HDTV. It will make holiday gift buying easy.*

Alfred Poor, HDTV Almanac

*Bruce Berkoff knows just how to explain HDTV so you can put your new understanding to work right away. I think my Mom can benefit from this book, too.*

Ross Young, Founder, DisplaySearch

Print edition ISBN 978-0-9651975-3-3: \$14.95

E-book edition ISBN 978-0-9651975-4-0: \$7.95

*Sometimes you think you may know something but then someone explains it in terms you can understand you all of a sudden say, "Oh, I get it now." This is the case with Bruce Berkoff's book about HDTV. Bruce obviously has a command of the subject matter and a talent for explaining it. He tells you what's important and what not to bother with like manufacturers' specs on contrast ratios which are measured under so many different conditions they become a meaningless comparison. I enjoyed this book and learned a few things about HDTV, I'd recommend it to anyone shopping for HDTV or just wanting to enhance their knowledge of this subject.*

-- Andrew Eisner

# Seeing red over being green

by Aldo Cugnini

Aldo Cugnini is a consultant in the digital television industry. Prior to founding AGC Systems, he held various technical and management positions at Philips Electronics' Research and Consumer Electronics Divisions and at interactive television developer ACTV. He had a leadership role in the development of the ATSC Digital Television System, and was a key member of the Advanced Television Research Consortium (ATRC) development team. Mr. Cugnini received his BS and MS degrees from Columbia University and has been awarded six patents in the fields of digital television and broadcasting. He served on the board of directors of the Advanced Television Technology Center, and is the author of numerous technical papers and industry reports, and is a regular contributor to several trade publications. This article is revised from the *Display Daily*, published by Insight Media on June 1, 2009. <http://www.displaydaily.com>



The consumer electronics industry has been taking steps to provide more environmentally-friendly products, but at the same time, there are signs of growing concern that the green initiatives will hurt the bottom line -- or make the problem worse.

The Consumer Electronics Association (CEA) announced in late May, the reactivation of the Set-Top Box Energy Consumption working group, R4 WG13. The Video Systems Committee working group will help to develop standards to measure energy consumption in televisions and other related video technologies and devices. This working group created CEA-2013, Digital STB Background Power Consumption and CEA-2022, Digital STB Active Power Consumption Measurement. CEA materials states that "CEA and its members are committed to increasing awareness of environmentally-friendly products, programs, standards and practices within the consumer electronics industry." On the other side of this, however, the CEA's online "Government Alert" warned that "New York City Finalizes Onerous E-Waste Law," and "New Study Shows Damaging Affects of Proposed CA TV Mandate."

On April 15, the New York City Department of Sanitation finalized regulations implementing the Electronic Equipment Recycling and Reuse Act. The legislation requires any electronics manufacturer that sells products in NYC to accept their products for recycling at no cost to the consumer. Effective July 1, 2010, it will be illegal for any person in NYC to discard any covered electronic equipment as trash.

At present, some nineteen states have e-waste recycling laws, and more are being written. All the states with current e-waste laws, except for California, have adopted "producer take-back," or producer responsibility, laws that require the manufacturers to pay for the collection and recycling of old products. With different states having a hodgepodge of different laws, the CEA is looking into pursuing a national framework for electronics recycling. The CEA also released a report stating that the "California TV Mandate Would Cost Jobs, Reduce State Revenue and Limit Consumer Choice." Among its findings, the study says that "California will lose \$50 million in sales tax revenue and 4,600 jobs state-wide, as a result of the California Energy Commission's (CEC) proposal to set arbitrary limits on television electricity usage." The study concludes several deleterious effects of the law, including, store closings and increased unemployment, increased retail prices, and reduced choice and decreased industry competition (83% of LCD TVs measuring 24-34 inches, 80% of current 35-39 inch LCD TVs, and 100% of current plasma TV models larger than 60 inches will be eliminated under new rules).

Clearly, the issue is complex. Manufacturers are willing to be environmentally sensitive – EnergyStar is a voluntary program that has had great success--but they need to make a profit, too. Recycling businesses are now gearing up to handle e-waste, but that will take time and investment. Meanwhile, local laws like that in NYC are essentially dumping the problem (literally) and the cost on someone else. The environmental group Greenpeace claims that up to 80% of e-waste from Europe fails to be disposed of safely, with some of it disguised as second-hand goods, and shipped off to Nigeria, where it is sold, scrapped or illegally dumped. The U.S. needs a coordinated policy that takes into account the many business, ecological, and global factors that are affected by e-waste. "Not in my backyard" is not an effective strategy.

# Attend the First Ever Green DISPLAY EXPO



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# Retrevo re-launches site with real-time reviews

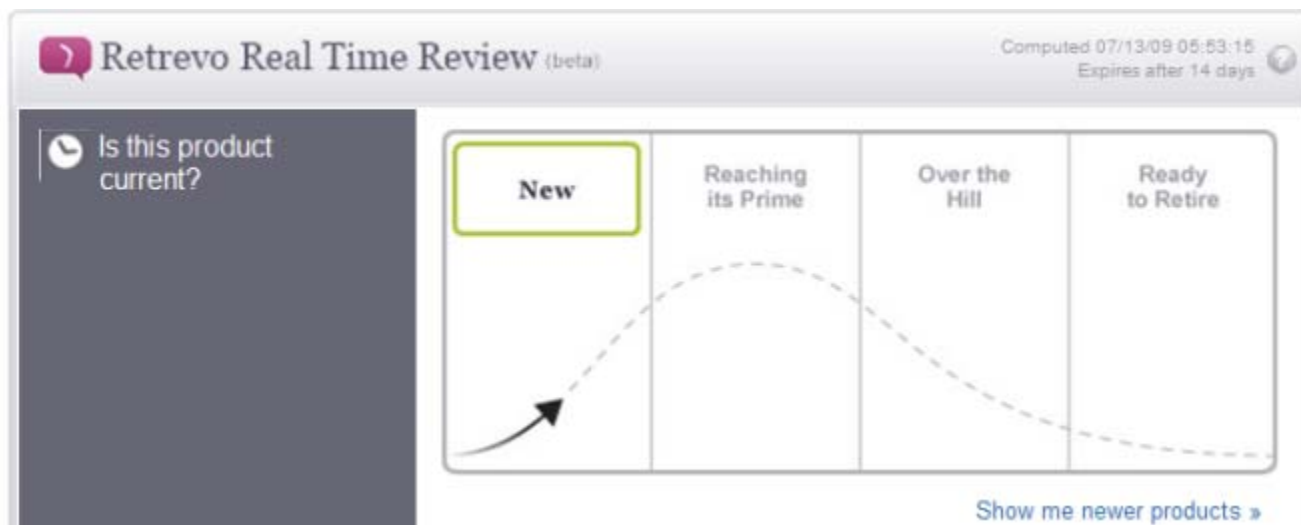
by Andrew Eisner

Andrew Eisner is a former test manager for Ziff Davis Labs and is currently director of content for Retrevo.com a website specializing in consumer electronics. Retrevo has reviews, manuals, and buying information for all popular gear and gadgets.

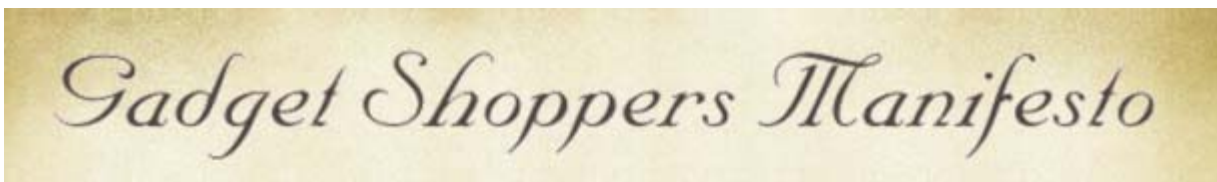
Retrevo calls its new site “retrevolutionary,” because they believe it offers new innovative features to create what it calls, “The Ultimate Electronics Marketplace.” <http://www.retrevo.com>. Retrevo uses AI technology and web data gathering techniques to collect and analyze millions of points of data, something most other “review,” sites can’t do using editors and reviewers.

**Product Life Cycle Analysis:** In preparation for launching their new site, Retrevo asked, “what are consumers biggest concerns when shopping for TVs and other electronics?” In a study commissioned by Retrevo, more than 80% of shoppers said they have purchased an electronics product that became obsolete soon after they purchased it. Retrevo admits that consumers are shooting at movie targets but believe the power of an AI-backed database of products and prices can be brought to bear on this problem, making buying an obsolete product less likely.

**Retrevo’s Real-Time Review:** Retrevo’s AI technology looks at the age of the product, velocity of adoption of the product and velocity of momentum through the sales channel to determine where the product is on the obsolescence curve. Retrevo’s Product Lifecycle graph will even predict when a product is on the path to obsolescence before it is announced end-of-life.



**Shoppers Bill of Rights:** As part of Retrevo’s goal to make shopping for electronics simple and fun and help consumers avoid shopping mistakes, they created a shoppers manifesto to address important concerns for consumers. <http://www.shoppingmanifesto.com>



**Value Assessment:** Another big concern of shoppers is buying an inferior product. That’s last thing you want is a TV that doesn’t work the way you thought it would or breaks soon after the purchase.

Value is computed daily by an algorithm that determines if a product is a good bang for the buck. The rating is computed by analyzing hundreds of thousands of product features available in various products, and the price at which features are available. A Value Rating reflects the deviation of the current price of each product from its fair value. Since the market conditions change on a daily basis and new products with new features are introduced frequently, a product's fair value and Value Rating assessment also changes constantly.



Community opinion is a good validation to check before deciding to buy a product. Retrevo makes this easy by aggregating ALL the expert and user opinions from all over the web and synthesizing them into a single overall community sentiment.

Good Value?	<b>YES!</b>	This product is selling below its fair price and is a good bang for your buck.
Do people like it?	<b>YES!</b>	The majority of people had <b>Positive</b> reviews and opinions about this product.

Another summary indicates how experts and users rated the products and links to the actual reviews are listed as well.

<b>EXPERT REVIEWS</b>	<b>USER REVIEWS</b>			
<p>Retrevo found <b>21 expert reviews</b></p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>AVG RATING</b>  <span style="font-size: 2em;"><b>90</b></span>              OUT OF 100         </div>	<p>Retrevo found <b>1055 user reviews</b></p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="background-color: #e0ffe0;">95% Positive</td> </tr> <tr> <td style="background-color: #ffffe0;">1% Neutral</td> </tr> <tr> <td style="background-color: #ffe0e0;">3% Negative</td> </tr> </table>	95% Positive	1% Neutral	3% Negative
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1% Neutral				
3% Negative				

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Is there a deal today?	<b>YES!</b>	Today's price is over 42% lower than we've seen in the last 14 days.
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Retrevo has introduced a daily deal checker as part of its product review that looks at historical price trends for various products (14 days by default) and recognizes when the price on a given day at a given store falls below the moving average, making it a real deal as opposed to "merchandised" or "manufactured" deals. Retrevo's algorithms track and analyze this data on a daily basis so deals are always fresh reflecting the current marketplace conditions.

**Bottom-line Analysis:** After all is said and done, Retrevo creates a buying recommendation. The Retrevo recommendation factors in all the data from the Retrevo Real Time review and produces a time sensitive



# Power Consumption: LCD vs. Plasma

by Jin Kim

Jin Kim is the founder and president at DisplayBlog, bringing together news, information and analysis from the high-tech display industry to help, educate and entertain. By combining the experiences and knowledge gained serving as senior marketing manager at LG Display and as director of TFT LCD Market Research at DisplaySearch, Kim brings a fresh look at the display industry and products such as LCD TVs, LCD monitors and notebook PCs. Kim received a BA at UC Berkeley and an MBA at from Claremont Graduate University.



Power consumption is becoming extremely important. At the same size and pixel format (also known as resolution) I would choose the TV that consumes less power even if that meant a little bit more money up front. You undoubtedly have heard from somewhere that plasma TVs consume more power. Is it true?

**Background Info:** This topic materialized after reading David Pogue's "apology post" about his passing comment concerning plasma being on the way out. Pogue wrote the apology post after getting slammed on by Gary Merson, editor of HDGURU:

"Despite plasma's superior picture quality and lower large screen pricing, many tech writers like New York Times columnist David Pogue who recently wrote that plasma is "on the way out," consider it a dying technology. Are they correct? Or are they in need of a fact transfusion?"

Merson then asked executives from LG, Samsung and Panasonic (three companies that continue to manufacture plasma TVs and are heavily invested in manufacturing plasma display panels) to answer some questions about plasma. What he asked isn't as important as this point I will make: I don't think asking executives from these three companies will yield any objective information that will help in assessing the future of plasma. It was probably somewhat naive of Merson to think that these executives from LG, Samsung and Panasonic would give him objective answers. But there were some interesting answers from these executives. One in particular got me interested in finding out more about power consumption.

This is what Tim Alessi, Director of Product Development, LG Electronics USA, said concerning misinformation:

"LG is a founding member of the Plasma Display Coalition, which is the voice of the plasma industry to promote its attributes as well as combat misinformation that arises, including some of the outrageous power consumption claims raised by some NGOs and agencies".

Outrageous Power Consumption Claims I'm guessing that some NGOs and some agencies are claiming that plasma TVs consume more power than LCD TVs. So I had to investigate and find out the truth.

**Three Companies:** There are only three companies that are plasma majors and they are LG, Panasonic, and Samsung in no particular order. I looked at their websites and wrote down all of their plasma TVs and all of their LCD TVs 40-inch and larger that are being sold today. Since plasma TVs that are sold in the US are all 42-inch and larger and Samsung's LCD TVs do not have a 42-inch size but a 40-inch size, I decided to start at 40-inches. I compiled all the power consumption specs I could find on their websites.

**Inconsistent:** What I noticed was that LG is very inconsistent in stating power consumption numbers. Some of the its products had the information but some didn't: it was about 50:50. Samsung was very consistent: none of its products had any power consumption numbers but just vague text stating that it was 25% less than comparable LCD TVs or 40% less than last year's models, etc. Panasonic was inconsistent too but I did find that a large portion of the models had power consumption specifications.

So this is what I found...



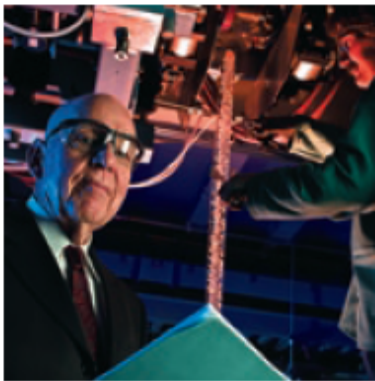
# More behind the glass

Corning is known for providing the LCD industry with a reliable supply of high-quality glass substrates. Yet the advantages we bring to customers extend well beyond the product itself. Our advanced products and technologies are backed by decades of leadership in research and development, extensive technical expertise, a commitment to addressing customer needs, and an ongoing spirit of innovation. At Corning, industry-leading products are just the beginning—there is always more behind the glass.

History



Knowledge



People



Technology



# The standard TV set

by Norman Hairston

This is the first recession where TV has meant LCD and not CRT. Norman Hairston is a third generation TV professional in that many of the people that he worked with early in his career had worked with the inventors of color TV set technology. He has held technical, commercial and strategic planning positions in the display industry and has worked with a variety of technologies including CRT, LCD, laser based displays, Telaria and CRT projection. He began his display career at Corning developing their early strategic plans for the LCD substrate business. He has since held display positions at Honeywell, Gemfire, Intel, and as a consultant. He holds both Chemical Engineering and Materials Science degrees from MIT and an MBA from Stanford.



TV screen sizes are measured diagonally. A 25V CRT TV has rounded corners a 27V has square corners. Most of the difference between the sizes of the two models is the extra distance obtained by squaring out the corners. In 1964, the first model of color TV widely introduced was the 25" round. An average set sold for \$400. By the mid 1990's, the price of an average set had declined to about \$380, which was a low price for a 27V. Though there was some size escalation between the mid 1990's and when CRTs finally fell from favor about 2006, the industry managed to sell almost exactly the same product for almost exactly the same price for the better part of 40 years. This article is about how they did it and it's follow-on the 32W, which happens to be almost exactly the same size (in terms of height) as the 27V and 25 round. The discussion below concerns average priced TV sets; of course the premium market can have different dynamics.

**Higher Value:** Though there is a dizzying amount of bells and whistles you can get on a modern TV, the fundamental improvements are what has driven sales and they can be classified into two categories: improvements in reliability and improvements in picture quality. The move from tubes to solid state circuitry was one of the more visible aspects of reliability improvement to the consumer as consumers no longer had to periodically disassemble their TV sets and take the vacuum tubes to the drug store for testing.

Another and less appreciated reliability improvement was the move to high voltage phosphors. Within the industry there was a rule of thumb called the "Columbic law"; in general the higher the energy to activate a phosphor, the longer the phosphor would last. Over the course of 40 years the industry moved to higher and higher voltages until phosphor degradation was no longer a factor. The higher voltages, combined with improvements in the shadow mask also brought the consumer a brighter image over time. Interestingly enough, the "Columbic Law" seems to also apply to Plasma screens as they exhibit image burn in problems similar to very early color TVs.

Concerning reliability, the industry has also provided the consumer with a better and better image over time. With LCD technology, until this point in time, a better image has primarily meant improvements in contrast and viewing angle. This has been because LCD technology began its commercial life with both. This was not a significant problem for CRT technology, consequently, the focus there, from an early time, has been black level. There have been three significant inventions here, black matrix in the 1960's, pigmented phosphors in the 1970's, and **36%** transmission glass in the 1990's. Both of these were significant enough improvements in picture quality that they were a reason for replacing an older set.

Beyond the quality and reliability improvements, there has been the addition of embedded applications such as the introduction of combo sets and supplemental content. At first glance a combo set seems like a giant step backwards in terms of reliability. At the point they were introduced, VCRs had an expected lifetime of about 3 years while TVs had a life approaching 15 years. Pairing a high maintenance item with a zero maintenance item would not seem the thing to do; however, it provided a significant increase in selling opportunities. In the stores, it was not so much a way of selling up the consumer from a non-combo TV as it was a way of selling up a consumer looking to replace their VCR which per the numbers just given happened 5 times more often.

Looking at all of the improvements in value, they were all provided a reason for the consumer to update their older TV sets and they were all implemented at virtually zero cost or, in some cases, as a cost reduction. Solid state

construction, any added cost for improving the grams of phosphor in a CRT or the grams of black matrix applied to the screen, adding a few tenths of a percent of cobalt to darken the glass, all of these had inconsequential manufacturing costs or in some cases were a cost reduction. In the LCD world, the introduction of **IPS** was similar. At the time it was implemented, it was actually one fewer mask step but resulted in a greatly improved visual image. Though adding a VCR to a TV was a significant cost, it led to significantly expanded selling opportunities for the retailer.

**Higher Perceived Value:** The practice of sizing a screen by stating its diagonal came from the original picture tube days when the screen was a round bottle masked off into a roughly square screen. The diameter of the bottle was the size of the screen. In Europe and Japan, the outside diameter of the bottle was used; in the US the inside diameter was used. This is more representative of the actual screen size. This meant that a US 19" and a European 20" were about the same size. Further, in the US, the screen would typically be written up into the heel of the glass bottle, i.e. the screen was enlarged and had rounded corners rather than a straight square mask. This meant that a US 19" could actually have a larger screen than a European 20". However, the terminology in the US was to call the 19" a 19V; V for viewable angle. (The 4:3 aspect ratio came about because of the desire for a wide image but at the same time being constrained by the circular bottle. Given a fixed diameter the difference between a 4:4 screen, which maximizes use of the available screen area, and a 4:3 is only 3% loss of screen area.)

When picture tubes went from round corners to square corners in the 1990's, squaring off the corners of a traditional US 19" design gave a 20" diagonal for something that was virtually the same size. The 19V became the 20 and the 25V became the 26V; the 26 was later dropped in favor of the 27 at the preference of the retailers who needed a bigger gap between the 25. The industry kept the 19V and the 25V around as loss leaders. However the stores would always try and trade up consumers to the next size as it "fits in the same space as the smaller screen". Typically a 20V would have a 10% mark up over a 19, the 27 mark up over the 25 could be even larger, but there were usually some added features on the 27 as well.

Finally they improved the sound. An experiment conducted by the MIT media lab two decades ago asked consumers to compare the pictures of two different TV sets. One was an analog HD set of the era; the second was a 4:3 NTSC set masked off to give a 16:9 picture. The consumers were almost unanimous in picking the set with the best picture as the set having the best sound. The "Home Theater" concept essentially was an effort to capitalize on sound/picture quality confusion.

**Lower Costs:** A VP at Intel often tells the story that he was at a dinner party where 12 guests showed up but there were only 10 steaks. When asked about what happened, he said, "I don't know, but I got my two." Though the industry was never wildly profitable, and a key input (the CRT glass bottle) was roughly tied to energy prices, the industry did manage to reduce costs on the same scale as general inflation. The main contributor to cost reduction across this time period was lower labor costs: implementation of more automated production, moving set production to low wage Mexican plants, streamlining of the product distribution chain.

In general the glass was about 1/3 of the price of a TV tube and the tube about 1/3<sup>rd</sup> the price of a finished set in the store. While a key input to the glass was the natural gas to run the glass making furnaces, the industry did benefit from returns to scale, moving to larger furnaces and robotics throughout the process. Tube making also benefited from a move to larger factories but the real cost reduction happened beyond the finished tube level. Set making was never very capital intensive, indeed Heathkit offered TVs that the consumers could build themselves. Setmaking did benefit from the disposal of the furniture of a console TV set and the resulting decline in shipping and inventory costs. However, one of the larger reductions in TV set costs was the consolidation of the distribution chain. As the sale of electronics moved from mom and pops to the superstores of today, there was an entire level of distribution cut out of the chain. The elimination of the distributors with their costs and profit margins occurred in the early 1990's; it was the distributors that didn't get any steak.

And finally, the CRT makers did one other significant thing for cost reduction; they voluntarily implemented product recycling and the recycling program extended beyond their own branded products to include CRTs generically. Though the industry program was initiated from outside the industry by Digital Equipment (DEC); it was Sony that insisted that the program be implemented as a cost reduction. CRT tubemaking never climbed much above a 95% yield. As a consequence, tubemakers had 5% of their production that they had to dispose of as hazardous



waste. In addition to the cost, the CRT waste was a barrier to full implementation Sony's zero emissions objectives. The program that was created involved Corning paying for post consumer waste directly and taking tube-manufacturing fall out from their customers at no cost. The absence of hazardous waste disposal fees allowed the glass to move in regular shipping rather than as hazardous waste.

**Trinitron:** It would not be appropriate to have a discussion about TV technology or TV pricing without at least mentioning the Trinitron. The Trinitron was left out of the foregoing discussion because, although it was a significant improvement in the TV picture, it was shortly eclipsed by black matrix. Though Trinitron offered continuing advantage in being able to be run at brighter levels, it was an innovation with some significant costs and which sold at a premium to the rest of the market. This discussion has largely been about average priced sets. <http://www.sid.org/archives/0%20-%20CRT%20pdf%20Exhibit%2006.pdf>

### Looking Forward:

*In many of the more relaxed civilizations on the Outer Eastern Rim of the Galaxy, the Hitch Hiker's Guide has already supplanted the great Encyclopedia Galactica as the standard repository of all knowledge and wisdom, for though it has many omissions and contains much that is apocryphal, or at least wildly inaccurate, it scores over the older, more pedestrian work in two important respects. First, it is slightly cheaper; and secondly it has the words Don't Panic inscribed in large friendly letters on its cover..."*

-- Hitchhikers Guide to the Galaxy

The CRT TV was able to survive 40 years of boom and recession at essentially the same size and price points. Though CRT makers did introduce larger sizes, going up to a 36V for a conventional consumer set, larger sizes meant more cost. Instead, by making multiple improvements to the product at virtually zero cost, they gave the consumer a continuing stream of more value and new reasons to replace their old TV set even if it were still working. This note began with a discussion of the 20V. In some sense the 20V exemplifies innovation in the TV industry. Nothing new went on the standard platform unless you could give it away for free. Of course there were other changes to the product beyond what is discussed here (the inclusion of Second Audio Program, V Chip, etc) but these were both minor cost and minor impact.

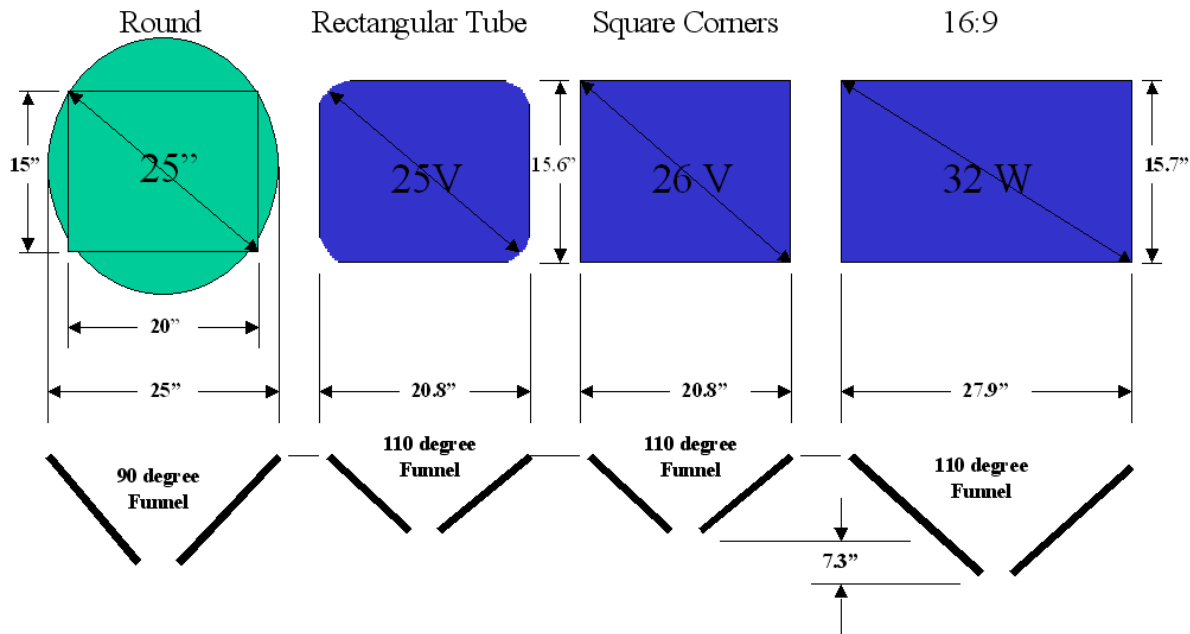
The market belongs to LCDs now essentially because the CRT makers passed it on to them as their final move to maintain pricing. Because the total beam deflection angle of a CRT is generally limited to about 110 degrees, for every inch wider a CRT became, it becomes  $\frac{3}{4}$ " deeper. Thus a 27V (with a screen that is 16.2" in height) in HDTV format becomes a 33W but also adds over 7" of depth in the back plus some additional bow in the front of the tube. It was never in the cards that HDTV in 16:9 format would be realized in CRTs but the wide aspect ratio was the thing that made HDTV significantly different in the consumers' perception. (Even today, prior to the full implementation of HDTV, many HDTV receivers are not connected to a HDTV source.) Even so, the consumer electronics industry pushed for a 16:9 version of HDTV over the objections of TV broadcasters; the CRT makers voted themselves out of existence. However, the move to wide screens for TV, as has been the move to wide screens for notebooks, instantly makes an entire generation of product look old and obsolete.

This is the first recession where TV has meant LCDs and not CRTs. As it is now a completely different set of manufacturing organizations with a very different product, the reactions will be different. LCD makers and they have responded to the recession by offering bigger screens at lower prices even though they have recently made dramatic improvements in the LCD picture quality. The response time problem is essentially fixed and the recent introduction of LED backlights gives a much more colorful picture than could be produced by a conventional CRT. So far in the 2008-2009 recession, the industry seems to have also cut production more than required. In the midst of the doldrums the industry is seeing spot shortages of 26W and 32W the standard (at least by height) size TV of the last 40 years; especially as the standard size closes in on its formerly standard price. Of course a HDTV needs to be more than twice as tall as an NTSC TV, when viewed in the same setting, in order to get the full benefit of HD. From 2003 to 2007, as flat panel replaced CRT, the average price of a TV rose from \$400 to \$750 where it peaked. The price of \$750 is about the current price of a 32W.

So the current situation is both very reminiscent of the last 40 years but in some ways unique. The main thing that is the same is the consumer. They have an idea of what an adequate size TV set is and are essentially buying a

16:9 version of the same 25 round from 1964. What is also the same is the industry's cost position. The industry is selling at cost and while the industry can and does offer larger sized product, the additional cost that comes with that larger size significantly narrows the market.

## The Evolution of the Standard TV



The main thing that is different is that the consumer's needs have changed. The 25 round was an adequate size to show a NTSC image but to get full benefit of a HD picture, the screen needs to be more than twice as tall. So the sets consumers are buying are actually inadequate for the main purpose they are buying, to serve as a living room set. The other thing that has been different has been a slow down in innovation during the recession. Early in the industry's history, slow downs were met with innovation. The 68-69 set sales slow down brought Trinitron and Black Matrix to market, 74-75 brought pigmented phosphors, later on the home theater concept was born out of a recession. The industry has been selling contrast ratio as the LCD figure of merit for some time. While as 19V/20V pricing demonstrated that consumers could be sold up based on a meaningless spec, the way contrast ratios are measured is meaningless in a practical setting and human beings can't see 10,000:1 anyway.

My impression is that the industry is missing out, or at least not emphasizing some obvious innovations. First, the green era is driving a need, maybe a requirement, for energy efficient TV sets. In addition to the energy efficiency, if you improve the overall efficiency of the optical train in an LCD you should get an LCD with the capability of being as much brighter as it is greener. Brightness sells, and it sells at a premium, witness the Sony XBR. Another green innovation could be recycling. The key to success of any recycling operation is having a customer for the recycled product. The CRT industry was able to implement recycling as a cost reduction because they were their own customers. Not many CRTs are being made these days, but there is an opportunity in electric power distribution. Nothing would help our shaky power distribution system quite as much as increasing its energy storage capacity. While the lead/acid batter makers have hazardous waste disposal licenses and are happy to be paid to take lead waste, it does have value to them. With the limited number of lead/acid battery makers, they do have monopsonistic power but their cooperation could be forced and consumers could be provided with an incentive by the LCD industry to get rid of their old CRTs.

Finally, there is the opportunity for embedded applications. People buy computers much more often than they buy TV sets. Text based applications also highlight the need for a larger screen. Further, for the retailer, PCs have a dizzying array of add-ons that the TV industry has never had. Given the decline in the cost of computers, particularly notebook computers, it surprising that the Combo hasn't resurfaced in a bigger way.

# Policy/Economy/Technology

## What Will We Get for Christmas?

by David Barnes

David Barnes brings more than forty years of experience in the capital equipment, semiconductor and TFT LCD markets to bear on client concerns. He introduced market-leading test-repair systems for TFT manufacture (ArrayChecker and ArraySaver lines) in the mid 1990's. Later that decade, he negotiated joint ventures between Philips Electronics and LG Electronics through due diligence, then stayed in Seoul to support the board from conception through the IPO in 2004. After the first dual listing on NYSE and KSE, he provided similar services to more clients as VP of Strategic Analysis for DisplaySearch. Assignments in recent years include IPO, project funding, underwriting, due diligence and debt restructuring. He now provides services through BizWitz, LLC. He attended the University of California at Santa Cruz.



This is the first article in what I hope will become a regular column in *LCD TV Matters*. The title is inspired by Berkoff's Law: "Politics trumps economics, economics trumps technology (and they all trump science)." That principle has helped me understand and anticipate many things over the past decade and I hope it will help you, also.

When I look at information provided by TFT-LCD producers in Asia and by government agencies in the United States, I try to see what patterns match and which conflict. One of the key patterns today shows that product demand by US consumers is less critical to panel makers than it was in the past. Demand from Chinese, Indian or Brazilian consumers compensates for slower demand growth in the USA or Europe. On the other hand, data from reliable sources such as DisplaySearch indicates that the average display size is decreasing for the first time in memory. That results from greater demand growth in poorer regions and less demand growth in richer ones. Demand for LCD TV sets is elastic relative to price and offering 24- or 26-inch panels is one way to increase the number of households able to buy LCD TV sets. In addition, new TFT fabrication plants coming on-line this year can make 26- or 32-inch displays with nearly the same efficiency as they can make 52-inch displays. Eighth-generation TFT fabs can produce three times more 32-inch panels and four times more 26-inch panels than 52-inch ones, however. That enables panel makers to meet demand for entry-level TV sets in emerging markets. Consequently, their average panel size is decreasing as emerging markets comprise a greater portion of global demand.

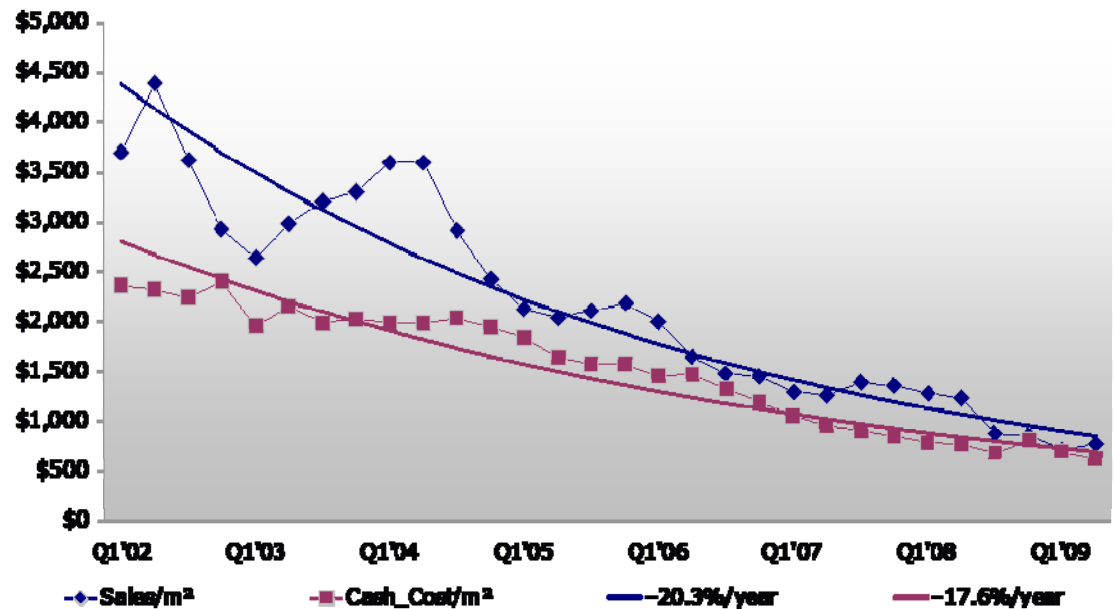
A second pattern became apparent before the present credit crisis: diminishing returns to scale. That is a fancy way to say that more capacity may allow producers to reduce their cost but force them to reduce price even faster. As the market matures, their average profit margin approaches zero. It is rational for producers to invest in more capacity until they reach that point, so they tend to do so. Public disclosures by LG Display (NYSE: LPL) demonstrate this tendency. Figure 1 charts the average sales per square meter of display from Q1'02 through Q2'09 in blue diamonds. It also charts the average cash cost, which is the cost of product reduced by depreciation and amortization charges, which are not cash costs. Plotted over 30 quarters, exponential curve fits show that the average area price falls 23% a year while the average cash cost falls more slowly at 18% a year. That squeezes the producer's cash profit margin over time: it has declined 12% a year since 2002. At that rate, the trend lines would intersect a few years from now. If they do, that implies that leading panel makers would be unable to sustain their business.

TFT-LCD producers have strong interests in price hikes, therefore. As shown in the oscillation of the blue line on trend, it is easier to change price than it is to change cost. As a result, panel producers invest in larger substrate capacity in order to build larger panels that command premium prices. They also create new panel sizes and formats in existing lines in attempts to reduce competitive price pressures. Unfortunately, such attempts may confuse the market and create only temporary advantages. On trend, margins still decline.

Under such conditions, producers will seize any opportunity to use material shortages or other factors as reasons for higher asking prices. Present conditions are a good example of this tendency. Sudden reductions in TFT capacity utilization in 2H'08 hurt some material suppliers deeply. Even glass substrate suppliers responded by turning some furnaces off, though they remained profitable overall. As TFT-LCD producers bring capacity back on-line, some experience shortages. Others claim shortages. In any case, constraints on production cause buyers to bid panel prices higher as they struggle to keep or sustain their market shares. Such dynamics led to an average area sales revenue increase of 8% Q/Q for LG Display even though the average price decreased 38% Y/Y in Q2'09. Put another way, square meters of display sold increased 53% Y/Y while the cash operating margin/m<sup>2</sup> decreased 68% Y/Y in Q2'09.

As we look forward to this year's holiday season, the question arises: How much higher can panel producers raise prices without reducing consumer demand for LCD TV sets?

**Figure 1 Display Area Sales and Cash Cost for LG Display (USD/m<sup>2</sup>)**



Source: author estimates for 2002–2003; LG Display disclosures, 2004–2009

The good news is that producer interest in higher prices and government interest in greater consumer spending (in China, et al) may support prices of larger LCD TV sets. Constraints on production, especially by Taiwanese panel makers, and demands for entry-level products in BRIC regions may sustain prices for smaller LCD TV sets through the year. Brands and retailers may use such support to limit discounts on larger sets because there is a natural relationship based on price per square inch. Without doubt, brands and retailers will position LED-backlit TV sets and internet-compatible sets as premium products this holiday season.

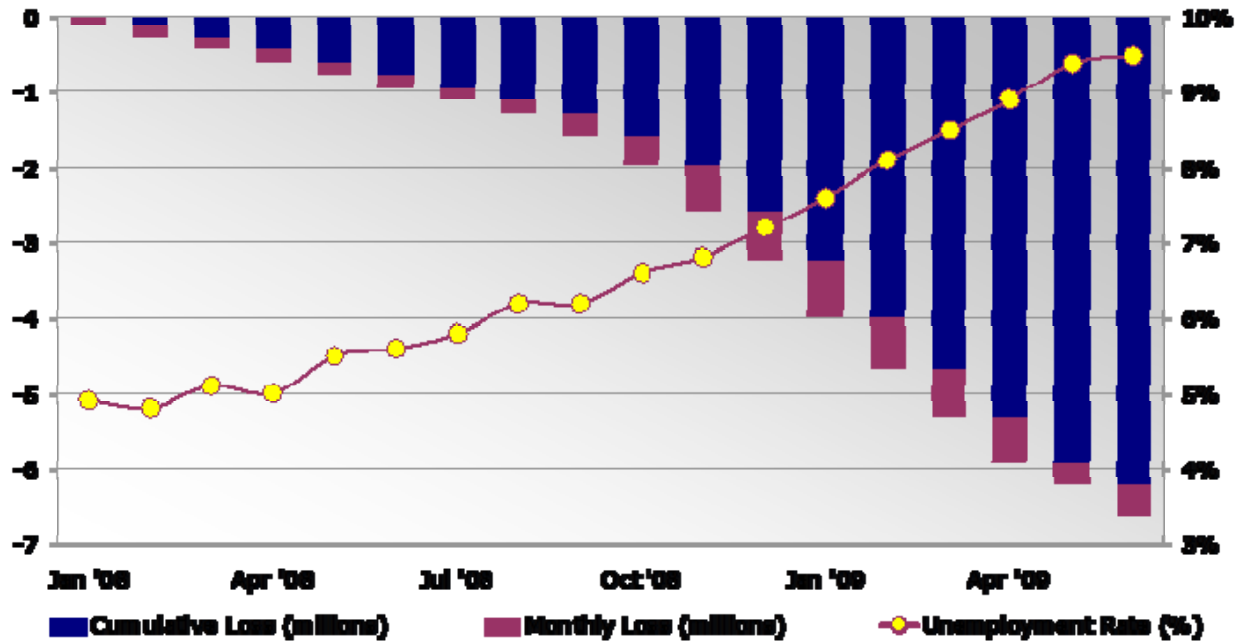
The bad news is that consumer spending in rich countries may constrain demand for larger, premium LCD TV sets. As charted in Figure 2, the cumulative loss of non-government (private) employment in the USA since December 2007 exceeded 6.6 million jobs in June. The official unemployment rate reached 9.5% and the total number of hours worked decreased. Consumers in the USA are saving more and spending less. For many years, they and consumers in Western Europe were the primary market for larger LCD TV sets. Even if employment rises or housing prices stabilize, they are unlikely to resume spending at levels considered normal before 2008.

The social shift from spend to save can be seen in the change in where people shop. Advance retail numbers for June (Figure 3), show spending at US electronics stores decreased 9% in the first-half of 2009 compared to 2H'08. The chart plots the increase or decrease each month relative to the prior year. It shows that electronics and appliance stores enjoyed rising receipts Y/Y until August 2008. The cumulative decrease exceeded \$5 billion from December 2007 to June 2009.

In summary, panel makers may expect (or even deserve) price support but they may find less demand for larger, premium displays that they expected when they invested in next-gen fabrication capacity. If so, they may allocate more of such capacity to serve entry-level market segments. The number of TV panels would rise because the next-gen glass substrates yield three or four times more sub-40" panels than they yield 52" panels. Rising output

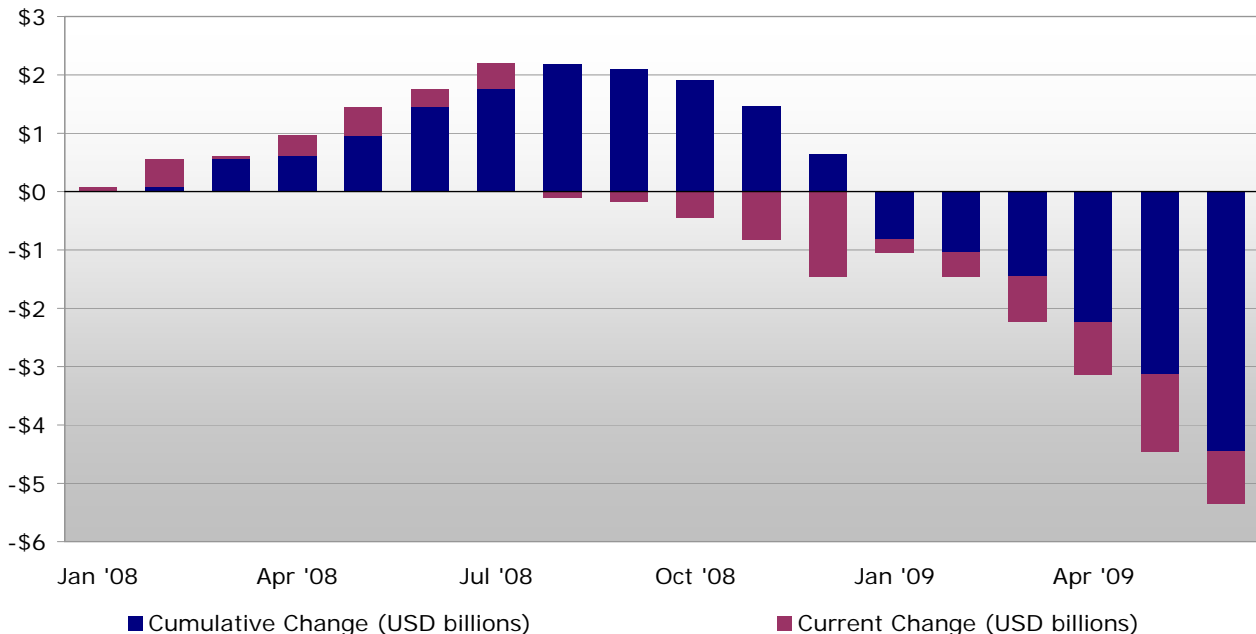
would lead to falling prices, unless demand in BRIC regions can rise to the occasion. If this occurs, we may get bargain-basement LCD TV sets this Christmas.

**Figure 2: Cumulative Loss in U.S. Private Employment since December 2007**



Source: US Bureau of Labor Statistics, total private employment (CES0500000001)

**Figure 3: Cumulative Loss (Y/Y) in U.S. Electronics Sales since December 2007**



Source: US Census Bureau, unadjusted retail sales by electronics and appliance stores (NAICS #433)

Advance figures for sales at warehouse and superstores (NAICS #45291) are not published but final numbers through May show receipts increased more than 3% above the first five months of 2008. US consumers are spending more at discount stores and less at full-service stores. This suggests that the product mix for LCD TV sets will become more weighted toward the low-price, high-value class. That is the class of products consumers seek at superstores or other discount outlets.

## “LED TV”...

by Alfred Poor

Alfred Poor is the editor and publisher of “HDTV Almanac”, a free daily service of news and commentary on the HDTV, digital television, and home entertainment electronics markets: <http://hdtvprofessor.com/HDTVAlmanac>. This article comprises four recent entries about LEDs and their introduction into the TV space.



**LED TVs: What Are They Really?** I’ll blame Samsung. Not their engineers who develop some great technology, and not their manufacturing people who execute those designs to create top quality products, but I expect that it’s the marketing folks who came up with this one. There’s a lot of buzz about “LED TVs”, which appears to be a term that Samsung started using first. And it apparently has confused and misled a huge number of people, convincing many of them that this is a new display technology. It’s not.

Let’s review. For flat panels televisions, there are only three technologies that are in commercial production, and I’m being generous with one of them. The hands-down leader is LCD, with plasma following a distant second. OLED doesn’t even show up on the pie chart, because Sony’s little non-HD jewel is the only one on the market (ignoring any mobile phones that can be used to watch TV content). LCD technology uses liquid crystal molecules like tiny shutters to transmit or block light from a backlight. Plasma uses a process similar to a fluorescent light to light up colored phosphors that emit the light that makes up the image. OLED stands for “organic light emitting diode (or display)” and is an amazingly thin device that can emit light of different colors when you run an electrical current through it. (It’s sort of the reverse of a solar cell, which takes in light and puts out electricity.) People are rightfully excited about OLED TVs because the color can be excellent and the incredibly deep black of the image creates outstanding contrast. It’s not clear when we’ll see OLED TVs in reasonable sizes at affordable prices, though some expect to see new products in this segment by the end of this year.

However, LED TVs are not OLED TVs. They are LCD TVs, and are little different from any other LCD TV that has been on the market. An LED is a solid state lighting device that generally creates a point of light. They are very energy efficient, and every power indicator you have on any electronic device is almost certainly an LED.

What Samsung has done – along with many other companies – is replace the fluorescent backlights on an LCD TV with LEDs. This has a number of advantages. LEDs can make the device more energy efficient, use less environmentally hazardous material, and generally provide a richer color response for the display. LEDs also give designers the choice of putting the backlight source either behind the LCD panel or off along the edges of the panel. Positioned in back, they make it possible to do localized dimming which can increase contrast. Positioned along the edge, they can result in a much thinner LCD TV.

So an LED TV is just an LCD TV with an LED backlight. The LED TV terminology appears to be an attempt to make them more appealing and sound new. And apparently it is working, which is a shame because many people think that the image is being made by LEDs, and is different from an LCD TV. Spread the word...

**“LED TVs”: Good News, Bad News:** First, the bad news: I’ve already expressed my concern over Samsung’s decision to use “LED TV” for their new line of LCD HDTVs, and I’m not alone. DisplaySearch, Insight Media, and even the New York Times have joined in the chorus to criticize this unfortunate choice. And now the hole in the marketing dike has grown larger; Toshiba now calls their line of LCD HDTVs with LED backlights “LED TVs”. According to one unofficial source, the company felt it had no choice in the face of Samsung’s campaign. So I expect more manufacturers to jump on the “LED TV” bandwagon, which will mislead consumers to think that these are not LCD panels, but are some different technology, perhaps even OLED. And it’s a shame.

Now for the good news. Whatever you call them, LCD TVs with LED backlights are better than those with the traditional CCFL (fluorescent) backlights. The color performance is better, and if you use local dimming, you can get enormous power savings. If you use the LEDs as edge-lights, you relinquish some of the advantages of local

area dimming, but you can make much thinner displays. At SID 2009, Samsung demonstrated a “NeedleThin” 24-inch LCD panel that was only 3.5 mm thick. That’s only a tiny bit more than one-eighth inch thick. Who needs OLED when you can make an LCD TV that is this thin? (And the viewing angle was excellent, by the way).

And the market is responding, in spite of the higher cost of LED backlight panels. DisplaySearch recently released a report that forecasts 109 million LED backlit LCD panels (10-inch or larger) will ship worldwide in 2009, which will represent about one in every five. This includes computer products in addition to TVs, and the popularity of the new “netbook” portable computer category plays a big role in these numbers. Another report by iSuppli predicts that nearly two out of every five LCD TVs will have LED backlights by 2013, forecasting a total of 90 million units for that year compared with less than half a million units last year.

The rapid growth of the LED business has resulted in strides in product quality and performance, and the increasing volumes help drive down costs. For the future, this will mean that the advantages of LEDs will increase, while the difference in price between them and CCFL backlit models will decrease. As a result, it is quite likely that your next LCD TV will likely have an LED backlight. Sadly, it will also probably be marketed as an “LED TV”.

**Sharp Joins the LED LCD Movement:** At their line show in New York City in early July, Sharp showed its new LE700 series of LCD HDTVs. Right off the bat, the good news is that the company is calling them “LCD TVs”, and choosing to name the series “AQUOS LED”. This is in contrast to Samsung and Toshiba who have chosen to use the misleading term “LED TVs” for their new products. In all three cases, these are still LCD TVs that use LEDs as the source of backlight illumination instead of the traditional fluorescent tubes.

Sharp’s new line is a full-array LED backlight, as opposed to an edge-light design. The trade-off is that the resulting panel is thicker than it could be with an edge light arrangement, but it enables local dimming that improves dynamic contrast ratio by turning down – or even completely off – the LEDs behind darker parts of the image. This approach also helps lower energy consumption, because the LEDs use less power when dim or off. Surprisingly, Sharp chose not to implement local dimming in the LE700 series; the most obvious explanation is that this may help keep costs down. Even so, these sets all beat the Energy Star guidelines by 50% or more. You still get the improved color performance and eco-friendly benefits that comes with an LED backlight.

**Daktronics shows off true LED TV at Infocomm 2009:** InfoComm is a show for dealers and professional installers, and has products for digital signage and meeting room applications and professional sound and staging and all sorts of cool bright and shiny things. But one of the displays that stopped me in my tracks was at the Daktronics booth. This company makes the large LED displays that are used to make stadium screens among other applications.

The setup on show at InfoComm used the company’s 6 mm pixel pitch LED modules, with 12 panels used to make this display. Note the silhouette of the person standing by the left edge of the display to get an idea of how big it really is. With a 4:3 aspect ratio, the display in the photo actually only had 480x360 pixel resolution; each panel has 120 by 120 pixels. To make a 720p HD resolution display, you’d need to stack up the panels until they stand about 14 feet tall; that’s too big for my living room. The panels are rated at 2,000 nits (which is very bright) and they are remarkably thin. And as the photo indicates, the image quality is remarkable. Need an HD display for your backyard sports arena?



# TV Ecosystem Conference

TV After the Digital Transition -  
Finding the Next Big Thing

September 2, 2009, San Jose, California



With the transition from analog to digital broadcasting and the conversion from CRT and rear projection to flat panel complete in most developed markets, the TV industry is facing slower growth. This conference will explore how new forms of content, connectivity, and technology could drive renewed growth in hardware. Featuring presentations from display and TV manufacturers, branded vendors, semiconductor design, retailers/channel participants, content developers and wireless/connectivity providers, this conference will be a forum for discussing growth drivers for the TV market.






















## Agenda-at-a-Glance
















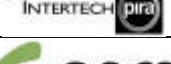









- Session I:** Supply Chain Analysis:  
Market trends and forecasts
- Session II:** System Architecture
- Session III:** TV Connectivity
- Session IV:** 3DTV

























# Display Industry Calendar of Events – 2009

A detailed calendar with active URLs is maintained by Veritas et Visus. Please notify [mark@veritasetvisus.com](mailto:mark@veritasetvisus.com) to have your future events included in the listing. [http://www.veritasetvisus.com/industry\\_calendar\\_2009.htm](http://www.veritasetvisus.com/industry_calendar_2009.htm).

<i>January 2009</i>			
January 3-5	Integrated Systems Europe 09	Amsterdam, Netherlands	
January 6-7	Storage Visions Conference	Las Vegas, Nevada	
January 7-10	Digital Hollywood at CES	Las Vegas, Nevada	
January 8-12	2009 International CES	Las Vegas, Nevada	
January 9	TFT and Materials	Shenzhen, China	
January 13-14	Metalization	Stansted, England	
January 16	3D Technology Update for Display Professionals	Costa Mesa, California	
January 18-22	Electronic Imaging 2009	San Jose, California	
January 19-21	Stereoscopic Displays and Applications	San Jose, California	
January 20	Wales and West Displays & Lighting Forum	Bath, England	
January 20-22	Semicon Korea	Seoul, Korea	
January 24-29	Photonics West 2009	San Jose, California	
January 27-29	ATEI 2009	London, England	
January 28-29	Japan Forum	Tokyo, Japan	
January 28-30	NEPCON World Japan	Tokyo, Japan	
<i>February 2009</i>			
February 2-5	Flexible Electronics and Displays Conference	Phoenix, Arizona	
February 4-5	It's Not Easy Being Green	San Jose, California	
February 7-12	Medical Imaging	Orlando, Florida	
February 17-19	Broadcast Video Expo	London, England	
February 17-20	Displays for Industrial, Household, and Auto Applications	Pforzheim, Germany	
February 20-22	Sound & Vision 2009	Bristol, England	















February 22-25	Focus on Imaging	Birmingham, England	
February 24-25	Transistors on Plastics	Cambridge, England	
February 24-25	EBU Display Seminar	Geneva, Switzerland	
February 27	Green Gadgets	New York, New York	
February 28 - March 3	LED China 2009	Guangzhou, China	
<i>March 2009</i>			
March 2-4	US FPD Conference	San Diego, California	
March 3-8	CeBIT 2009	Hanover, Germany	
March 4-5	Electronic Displays Conference 2009	Nuremberg, Germany	
March 4-5	HD Expo	Beverly Hills, California	
March 5-6	ITC'09 / SID Mid Europe Spring Conference	Paris, France	
March 9-11	Photonics in Surveillance and Biometrics	Washington, D.C.	
March 9-12	DVB World 2009	Berlin, Germany	
March 9-12	O'Reilly Emerging Technology Conference	San Diego, California	
March 10	Integrating Plastic Electronics	Oxford, England	
March 10-11	TV of Tomorrow Show	San Francisco, California	
March 10-12	Smart Fabrics 2009	Rome, Italy	
March 11-13	FPD China	Shanghai, China	
March 11-14	EHX Spring	Orlando, Florida	
March 14-15	Symposium on 3D User Interfaces	Lafayette, Louisiana	
March 14-19	Virtual Reality 2009	Lafayette, Louisiana	
March 17-19	Air Traffic Control	Amsterdam, Netherlands	
March 17-19	Semicon China	Shanghai, China	
March 17-19	electronica & ProductronicaChina 2009	Shanghai, China	
March 17-19	Laser World of Photonics China	Shanghai, China	
March 17-21	Emissive and Organic Emissive Displays	Nottingham, England	

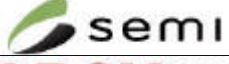

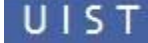



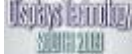


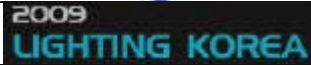
















March 18-20	Symposium on Haptic Interfaces and Virtual Environments	Salt Lake City, Utah	
March 23-27	2009 Measurement Science Conference	Anaheim, California	
March 24-26	Image Sensors Europe 2009	London, England	
March 24-26	Phosphor Global Summit 2009	Miami, Florida	
March 24-26	Future of Television	Los Angeles, California	
March 30 - April 2	Showwest 2009	Las Vegas, Nevada	
March 30 - April 3	MIPTV	Cannes, France	
March 31 - April 2	LEDs Asia	Hong Kong, China	
March 31 - April 2	Display 2009	Paris, France	
March 31 - April 3	Active Matrix Displays	Dundee, Scotland	
<i>April 2009</i>			
April 4-9	CHI 2009	Boston, Massachusetts	
April 6-9	Miniature and Near-to-Eye Displays	Edinburgh, Scotland	
April 7-8	Printed Electronics Europe	Dresden, Germany	
April 7-8	Photovoltaics: Beyond Conventional Silicon	Dresden, Germany	
April 7-8	Screen Expo Europe	London, England	
April 8-9	PV Korea 2009	Seoul, Korea	
April 9-10	2009 Taiwan FPD Conference	Taipei, Taiwan	
April 9-10	Global FPD Partners Conference	Tokyo, Japan	
April 15-17	Touch Panel Japan	Tokyo, Japan	
April 15-17	FineTech Japan & Display 2009	Tokyo, Japan	
April 15-17	LED/OLED Lighting Technology Expo	Tokyo, Japan	
April 15-18	International Sign Expo	Las Vegas, Nevada	
April 18-23	NAB 2009	Las Vegas, Nevada	
April 19-24	European Conference on Liquid Crystals	Colmar, France	
April 22-23	Interactive Displays 2009	San Jose, California	
April 26-30	Digital Holography and Three Dimensional Imaging	Vancouver, British Columbia	

April 27-29	Organic Photovoltaics	Philadelphia, Pennsylvania	
April 27-30	IDMC/3DSA/Asia Display 2009	Taipei, Taiwan	
April 28-30	Sign UK/Digital Signage Showcase	Birmingham, England	
April 30	Workshop on Three-Dimensional Television Broadcasting	Geneva, Switzerland	
April 30	Emerging Display Technology	Cambridge, England	
<i>May 2009</i>			
May 3-7	Nanotech Conference & Expo	Houston, Texas	
May 4-9	3DTV-CON 2009	Potsdam, Germany	
May 5-7	Digital Signage Expo 2009	Essen, Germany	
May 5-7	SGIA Membrane Switch & Printed Electronics Symposium	Overland Park, Kansas	
May 5-8	International Conference on Animation, Effects, Games, and Digital Media	Stuttgart, Germany	
May 6-7	Digital Signage Show 2009	Las Vegas, Nevada	
May 12-15	Orbit-iEX	Zurich, Switzerland	
May 13	Laser Processing for Plastic Electronics	Abingdon, England	
May 14	Printed Electronics Workshop Commercialization Opportunities and Challenges	Clemson, South Carolina	
May 18-19	Organic Electronics: Entrepreneur Training Day and Venture Forum	Brussels, Belgium	
May 20-22	SEMICON Singapore	Singapore	
May 20-23	International FPD Korea	Seoul, Korea	
May 20-23	LED & Solid State Lighting Expo	Seoul, Korea	
May 21-22	HDTV Conference China	Shenzhen, China	
May 23-26	China Optoelectronics & Display Expo	Shenzhen, China	
May 27-29	Light & Lighting Conference	Budapest, Hungary	
May 31 - June 5	SID International Symposium	San Antonio, Texas	
<i>June 2009</i>			
June 1-2	SID Business Conference 2009	San Antonio, Texas	


















June 2	Dynamic Digital Facades	London, England	
June 2-3	Ink Jet Technology Showcase 2009	Zurich, Switzerland	
June 2-4	E3 Media and Business Summit	Los Angeles, California	
June 2-4	SEMICON Russia 2009	Moscow, Russia	
June 2-4	Dimension3 Expo	Seine-Saint-Denis, France	
June 2-4	Digital Living Room Conference	Santa Clara, California	
June 2-6	Computex 2009	Taipei, Taiwan	
June 2-8	International Summer School on OLEDS	Krutyn, Poland	
June 3-4	EuroLED 2009	Coventry, England	
June 4-9	SIIM 2009	Charlotte, North Carolina	
June 8-10	Plastic Electronics Asia	Taipei, Taiwan	
June 9-11	Plastic Electronics Asia	Taipei, Taiwan	
June 11	HD Expo	Chicago, Illinois	
June 11-13	Photonics Festival: OPTO Taiwan , SOLAR, LED Lighting, Optics	Taipei, Taiwan	
June 15-16	Projection Summit	Orlando, Florida	
June 15-17	International Conference on Organic Electronics	Liverpool, England	
June 15-18	Laser World of Photonics	Munich, Germany	
June 16-17	Web3D 2009 Symposium	Darmstadt, Germany	
June 16-18	National Electronics Week	London, England	
June 16-19	Display Metrology Short Course	Boulder, Colorado	
June 17-19	InfoComm '09	Orlando, Florida	
June 22-25	Cinema Expo	Amsterdam, Netherlands	
June 22-25	CEDIA Expo Europe	London, England	
June 23-25	LOPE-C -- Large Area, Organic and Printed Electronics Convention	Frankfurt, Germany	
June 25-26	Korea Display Conference 2009	Seoul, Korea	
June 30 - July 2	Advanced Lighting 2009	Prague, Czech Republic	

<i>July 2009</i>			
July 2	3D Technologies and Projection Displays Seminar	Leicester, England	
July 8-10	China International Flat Panel Display Exhibition	Shanghai, China	
July 8-10	China International Touch Screen Exhibition & Seminar	Shanghai, China	
July 8-12	International Symposium on Flexible Organic Electronics	Halkidiki, Greece	
July 8-13	National Stereoscopic Association Convention	Mesa, Arizona	
July 10-13	SINOCES	Qingdao, China	
July 13-15	Nanosciences & Nanotechnologies	Thessaloniki, Greece	
July 13-17	International Symposium on Display Holography	Shenzhen, China	
July 14-16	Semicon West 2009	San Francisco, California	
July 14-16	Intersolar North America	San Francisco, California	
July 15	Towards 5 Micron patterning for plastic electronics	Manchester, England	
July 16	2009 Small-Medium Display Forum	Taipei, Taiwan	
July 19-24	International Conference on Human-Computer Interaction	San Diego, California	
July 28	Printed Electronics for Printers	Bristol, England	
July 29-30	Japan Forum	Tokyo, Japan	
<i>August 2009</i>			
August 2-7	Chemistry for Electro-optic Displays Symposium	Glasgow, Scotland	
August 3-7	SIGGRAPH 2009	New Orleans, Louisiana	
August 16-18	Australasian Gaming Expo	Sydney, Australia	
August 20	Printed Electronics Workshop	Binghamton, New York	
August 20	Displaybank US Conference	Santa Clara, California	
August 31 - September 4	SLIDE 2009	Linz, Austria	
<i>September 2009</i>			
September 1	Digital Signage 2009	San Jose, California	

September 1-5	HCI 2009	Cambridge, England	
September 2	TV Conference 2009	San Jose, California	
September 3	UK Plastic Electronics Development Showcase	Birmingham, England	
September 3	Touch Conference 2009/Emerging Technology Showcase 2009	San Jose, California	
September 3-4	China FPD	Shanghai, China	
September 4-9	IFA 2009	Berlin, Germany	
September 4-9	International Symposium on Wearable Computers	Linz, Austria	
September 6-9	China International Optoelectronics Expo	Shenzhen, China	
September 7-10	Foundation in Displays	Dundee, Scotland	
September 8-11	electronicIndia	Bangalore, India	
September 9	EL Workshop	Swansea, Wales	
September 9-13	CEDIA Expo 2009	Atlanta, Georgia	
September 9-14	International Stereoscopic Union Congress	Gmunden, Austria	
September 11-13	Taitronics India 2009	Chennai, India	
September 11-15	IBC 2009	Amsterdam, Netherlands	
September 13-16	PLASA '09	London, England	
September 14-17	Eurodisplay	Rome, Italy	
September 16-17	3D Entertainment Summit	Los Angeles, California	
September 17	Successful Adoption of Current Generation Printed Electronic Devices	London, England	
September 20-25	International Conference on Digital Printing Technologies	Louisville, Kentucky	
September 20-25	Digital Fabrication 2009	Louisville, Kentucky	
September 28-30	Organic Semiconductor Conference 2009	London, England	
September 29-30	RFID Europe	Cambridge, England	
September 28 - October 1	Liquid Crystal Displays	Oxford, England	
September 29 - October 3	OLEDs World Summit 2009	San Francisco, California	
September 30 - October 1	Printed Electronics Asia	Tokyo, Japan	

September 30 - October 2	Semicon Taiwan 2009	Taipei, Taiwan	
September 30 - October 2	Symposium on Applied Perception in Graphics and Visualization	Chania, Crete, Greece	
<i>October 2009</i>			
October 4-7	Symposium on User Interface Software and Technology	Victoria, British Columbia	
October 6-8	Semicon Europa 2009	Dresden, Germany	
October 6-10	CEATAC Japan 2009	Tokyo, Japan	
October 6-11	CeBIT Bilisim EurAsia	Istanbul, Turkey	
October 7-8	Displays Technology South	Reading, England	
October 7-10	ASID'09	Guangzhou, China	
October 8-11	Taipei Int'l Electronics Autumn Show	Taipei, Taiwan	
October 12-13	Lighting Korea	Seoul, Korea	
October 12-13	Workshop on the Impact of Pen-based Technology on Education	Blacksburg, Virginia	
October 12-16	International Meeting on Information Display	Seoul, Korea	
October 13-14	Asian Solar/PV Summit	Seoul Korea	
October 13-15	Image Sensors	San Diego, California	
October 13-16	ElectronicAsia 2009	Hong Kong, China	
October 18-21	AIMCAL Fall Technical Conference	Amelia Island, Florida	
October 19-22	Display Measurement -- Physical and Human Factors	Dundee, Scotland	
October 19-22	SATIS 2009	Paris, France	
October 20-22	LEDs 2009	San Diego, California	
October 21-23	Integrated Systems Russia	Moscow, Russia	
October 26-29	Showeast	Orlando, Florida	
October 27	Green Display Expo	Washington, D.C.	
October 27	Smart Textiles 2009	Dresden, Germany	
October 27	Printed Silicon and Hybrids 2009	Dresden, Germany	
October 27-29	Plastic Electronics 2009	Dresden, Germany	
October 27-29	Solar Power International	Anaheim, California	



October 27-29	SMPTE 2009	Hollywood, California	
October 28-30	FPD International	Yokohama, Japan	<b>FPD International</b>
<i>November 2009</i>			
November 3-5	International Workshop on 3D Geo-Information	Ghent, Belgium	
November 4-5	HD Expo	Burbank California	
November 5-6	Workshop on Virtual Reality Interaction and Physical Simulation	Karlsruhe, Germany	<b>VRIPHYS 09</b>
November 5-7	Viscom	Milan, Italy	
November 9-10	It's Not Easy Being Green	Irvine, California	
November 9-13	Color Imaging Conference 2009	Albuquerque, New Mexico	<b>SID</b> 
November 10-11	Digital Signage Show 2009	New York, New York	
November 13	Taiwan TV Supply Chain Conference	Taipei, Taiwan	
November 16-18	International Workshop on Flexible and Stretchable Electronics	Ghent, Belgium	
November 16-21	FPD & LED Expo 2009	Shenzhen, China	
November 23-25	Tabletops and Interactive Surfaces	Banff, Canada	
November 26-28	China International Touch Screen Exhibition & Seminar	Shenzhen, China	
November 30 - December 2	International Symposium on Visual Computing	Las Vegas, Nevada	<b>ISVC09</b>
<i>December 2009</i>			
December 2-3	Forum 'be-flexible'	Munich, Germany	
December 2-3	Printed Electronics US	San Jose, California	<b>IDTechEx</b>
December 2-4	SEMICON Japan	Tokyo, Japan	
December 6-10	International Conference on Organic Solar Cells	Cairns, Australia	<b>11th PACIFIC POLYMER CONFERENCE 2009</b>
December 8-10	CineAsia	Macau, China	
December 9-11	International Display Workshops	Miyazaki, Japan	<b>SID</b>
December 14-17	Optics for Displays	Cambridge, England	
December 16-19	SIGGRAPH Asia	Yokohama, Japan	

# “A Great TV in Every Room”



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For more information on the LCD TV Association, membership, or to join, please visit us on the web at [www.LCDTVAssociation.org](http://www.LCDTVAssociation.org) or email [membership@LCDTVAssociation.org](mailto:membership@LCDTVAssociation.org)

## Sustaining Members



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