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"LCD TV Matters"
Volume 1, Issue 3

"A Great TV in Every Room"

Contents

Chairman's Corner: Touch and 3D…

by Bruce Berkoff

Welcome to the Winter 2008 edition of our LCD TV Association Newsletter, post CES but in the midst of the US election primary heat as well as a probable USA housing inspired recession which may, or may not, put a dent in what either way will surely be robust growth in the LCD TV market in the US, as well as globally. This follows the record setting Q4'07 where LCD TV sales surpassed CRT sales by units for the first time ever, at about 28.5 million unit (*see Ross Young's DisplaySearch article on page 21*). Unit growth, as well as average size will continue to grow in 2008, helped onward by the Beijing Olympics, of course, the only question will be how big a growth and with what price declines. Will they be the modest/high teens year over year as in Q4'07 (*as shown in WitsView article on page 23*)?

In any event, it is our belief that unit growth in China and globally will surprise most analysts on the upside this year and for many years to come, as the "BRIC" countries also begin to embrace LCD TVs in earnest (and the manufacturing base gears up to support them as well).

Yet what else does the future hold for LCD TVs and TV entertainment in general?

We think we've seen a hint of things to come at CES'08 and other venues recently, and in many ways it adds new uses and markets as well to the future of LCD TV panels and sets, from 3D entertainment to large public display touch screens, with potential uses throughout various commercial venues from museums to shopping centers to at yet undreamt of applications. LG.Philips LCD (soon to be known as LG Displays) showed the world's largest LCD touch screen at CES and, on the NBC Today show, a great software interface to remind one of a large (52-inch) iPhone, and a Google Earth demo (*see photo*) enabled with an edge implanted IR multi-touch interface that people could not keep their hands off of at the show. It was really impossible to not want to touch it with both hands, as well as their large multi-screen wall based displays which had various neat demos ranging from shopping mall maps to video catalogs.

LG.Philips LCD showed off a 52-inch touch-enabled LCD at CES 2008, the world's largest

Other great demo's at the show included many image quality enhancements and set improvements from scanning and LED backlights to dynamic contrast and power saving electronics as well as more forward-looking technology, such as various types of 3D displays.

Now 3D we believe might be quite long term for "home" entertainment mass applications, given that it took 30 years to go from our last color TV transition to our current HDTV conversion, but clearly for games and certain movies (especially in the new 3D theaters sprouting up) it could make for a unique value proposition, given a couple of caveats. First, for home screen mass use, 3D appeal probably requires a good 2D/3D switchable screen in that if one could make an LCD which looks as good as current regular 2D LCD also be capable of a 3D image it would be far more versatile and desirable than a screen that only does 3D and looks pretty poor for normal 2D images and movies. Secondly, the current rush of 3D movies on the big screen will certainly open up the doors to

people wanting to see more 3D entertainment, though we believe the new 3D big screen will really open up new appreciation of things like rock concerts and Broadway shows to a huge new audience where everyone can feel like they are in the front row, yet at affordable prices, just with a lightweight set of polarized glasses perhaps.

In fact, our esteemed editor Mark Fihn was kind enough to take me to one of the first showings of the U23D movie, which opened my eyes to how appealing this type of large screen entertainment can be in place of live performances like concert and plays (besides the obvious movies, which are more content dependent in their fit for a 3D medium).

Museum information panels such as the one shown in the left image will become increasingly educational as the touch-enabled displays get larger and more interactive. 3D art forms such as the light sculpture depicted in the middle image will be enjoyed by more people using 3D displays in the future. The right image is from the live action cinema event U23D, which lets everyone feel like they are in the front row!

In any event, many new technology improvements are coming to LCD TVs, to go along with the growth in size, market penetration and units (not to mention new fabs and investments yet to come). For all flat TVs, this truly will be a year of "Olympic" proportions.

Warmest regards,

Bruce Berkoff, Chairman, bruce@lcdtvassociation.org
LCD TV Association
"A Great TV in Every Room"

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 6 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 fables 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 speaker and author in the display and electronics industry. He has display related patents both granted and pending in the US 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 currently sits on the boards of four publicly traded companies: InFocus Corporation (INFS), Syntax-Brillian Corporation (BRLC), Tvia, Inc. (TVIA) and Uni-Pixel, Inc. (UNXL), and is known for his many visionary talks at display and technology related conferences around the globe.

LCD TV news

compiled by Veritas et Visus

AMD launches Xilleon panel processors to improve LCD TVs image quality

AMD unveiled a new family of AMD Xilleon panel processors designed to provide unrivaled visual quality in LCD digital TVs. AMD's new panel processors deliver advanced motion compensation and frame rate conversion technology for excellent image processing, resulting in a rich, immersive entertainment experience. As consumers demand ever-larger TVs with greater visual clarity, such as that offered by full high-definition (1080p) technology, the appearance of picture defects such as blurred motion, or jerky movements referred to as "film judder," can detract from the viewing experience and leave consumers dissatisfied with their TV purchase. This trend toward larger TVs, coupled with the global transition to digital TV broadcasts starting with the US in early 2009, has significantly increased the importance of DTV visual quality. To help LCD TV manufacturers deliver a superior visual experience, the new AMD Xilleon 410, 411, 420 and 421 panel processor family is designed to provide unrivaled picture quality up to full HD resolution, with design flexibility to enable TV brand differentiation, and system integration to help reduce manufacturing costs. This advanced technology has been chosen by Samsung for its patented 120Hz Motion Compensated Frame Interpolation (McFi) solution. AMD Xilleon panel processors offer motion compensation and frame rate conversion based on AMD's enhanced phase-plane correlation technology, supporting high-quality visual processing for 100Hz/120Hz LCD TVs up to full HD resolution. The key is the processor's ability to identify incoming 24Hz/60Hz film and video signals and convert them to 120Hz by determining motion between picture frames and intelligently creating additional content frames to represent that "in-between" motion with exceptional clarity. To provide greater flexibility for manufacturers to customize their TVs, these AMD panel processors offer a high degree of programmability and can be integrated into the LCD panel subsystem or TV motherboard. Mitsubishi MZW series 120Hz LCD TVs, which are based on Samsung's McFi solution and the AMD Xilleon panel processor, are available in three panel sizes in Japan. Other leading TV manufacturers are expected to adopt AMD Xilleon panel processors in early 2008. http://www.amd.com

Philips Aurea LCD TV targets high-end European market

Like Sony's Bravia and Sharp's Aquos, Aurea is the new sub-brand for Philips LCD TVs. But in the way the trio market their products, Philips has taken a different approach. Excluding some small sized models and a few very small regional-sized markets, Bravia and Aquos are respectively the generic

symbol of Sony and Sharp-made LCD TVs. Philips Aurea, on the other hand, represents only the most elite class of LCD TVs targeted for the Europe market. Unlike other consumer electronic companies, Philips does not particularly emphasize on the specifications of its TVs in Europe. For example, Philips did not launch its 47-inch and 52-inch TVs until the end of 2007. By contrast, Samsung, Sharp and Sony are already going head to head in the 65-inch and 70-inch market segment. Currently, there is only one market available Aurea model - the 42PFL9900D. Like today's high-end TVs, the set is equipped with features such as FHD and 100Hz refresh rates. The model also comes with Philips proprietary Ambilight feature. Specs include 1920x1080 resolution, 550 nits, brightness, 1200:1 contrast ratio, and 3 ms response time.

Corning introduces Jade advanced display glass

Corning Incorporated announced at CES the commercial launch of Jade glass for advanced displays, a fusion-formed glass with high thermal stability, designed to address the high-end, feature-rich mobile device market. Jade works with two key display technologies, low temperature polysilicon (LTPS) applications and OLEDs, to help solve some of the challenges facing the mobile device industry. Unlike glass substrates made by other suppliers, Jade needs no secondary heat treatment or polishing to meet the demanding surface and thermal stability requirements of the LTPS and OLED manufacturing process. Jade permits the tighter design rule needed for increased integration of electronic functionality onto the glass. For device makers, this type of component integration means lower cost and increased design flexibility; for consumers, the end result is more compact devices that are brighter, higher resolution, and longer battery life. http://www.corning.com/displaytechnologies

Corning adds LCD glass capacity in Taiwan

Corning Incorporated approved a capital expenditure plan of $453 million to further expand its LCD glass substrate manufacturing facility in Taichung, Taiwan. This will be the fourth phase of expansion for the Taichung facility, which opened in 2006. The additional capacity enables greater manufacturing capabilities for a range of large-size substrates, including Gen 8. The expenditure will be incurred over the next two years, with mass production scheduled to begin by the first quarter of 2009. Production will continue to come online through the end of 2009. The Taichung facility manufactures Gen 5 and larger glass substrates, suited to meet the high demand of the LCD TV market. The glass manufactured at the facility is Corning's EAGLE XG glass composition, the first glass substrate to contain no added heavy metals or halides. http://www.corning.com
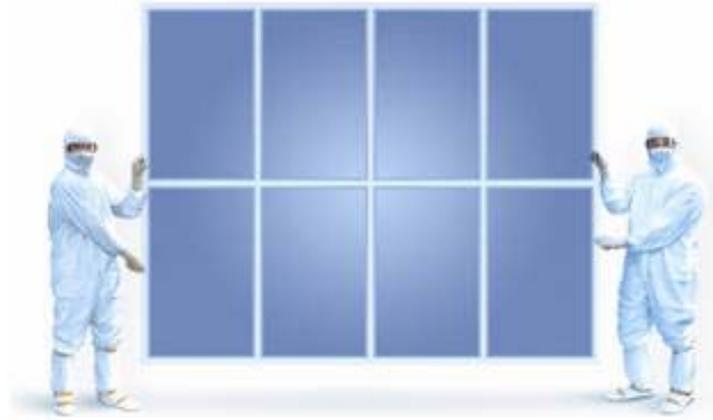
Corning's glass substrate expansion supports Gen 8 substrates which are capable of producing eight 46-inch panels

LG.Philips LCD changing name to LG Display

LG.Philips LCD plans to change its official corporate moniker to LG Display upon approval at the firm's annual general meeting of shareholders Feb. 29. LG Display will continue to manufacture TFT-LCD HD and SD TV units. The company said its new corporate name was designed to "reflect the company's business scope expansion and business model diversification, the change in corporate governance following the reduction of Philips' equity stake, and LG's commitment to enhanced responsible management." LG.Philips LCD currently operates seven fabrication facilities (and four back-end assembly plants) in South Korea, China and Poland.

SIM2 and Dolby Laboratories collaborate on high dynamic range technology

SIM2 Multimedia and Dolby Laboratories announced that SIM2 is working with Dolby to develop new prototype high dynamic range (HDR)-enabled liquid crystal display (LCD) flat screens using Dolby's new light-emitting diodes (LED) local dimming technology. In addition, SIM2 will provide Dolby with manufacturing reference designs. The new prototype displays will feature Dolby's dynamic range imaging technologies, Dolby Contrast and Dolby Vision, incorporated in SIM2's industrial concept. Dolby Contrast leverages LEDs with local dimming to provide dramatically enhanced contrast. Dolby Vision combines high brightness with enhanced contrast to deliver picture quality that virtually matches real-world visual perception of depth, detail, and color. The technology is based in part on BrightSide Technologies' HDR developments. http://www.dolby.com/promo/hdr/technology.html

JVC announces world's thinnest LCD TVs

JVC unveiled the world's thinnest LCD TVs with built-in tuners. The new line of Full HD TVs also weigh less and consume less power than conventional LCD TVs. JVC's LCD TVs feature a cabinet that across most of its width measures a mere 1.5 inches (39 mm) deep, with a maximum depth of just 2.9 inches (74 mm) at the panel's center. The design ensures that from nearly any angle, the sets present a super-slim appearance. Complementing the slim design is a thinner bezel, further minimizing the presence of the cabinet. The new designs will be available in two screen sizes in the US, the 42-inch LT-42SL89 and the 46-inch LT-46SL89. Both offer 1920x1080p resolution. The slim design was made possible through the use of a new JVC-developed slim panel backlight unit and power supply substrate. The backlight unit is 40 percent smaller in depth and bezel width compared to a conventional LCD backlight, measuring just 0.79 inches (20 mm) deep and 0.51 inches (13 mm) wide. In addition, the unit weighs only 26.4 lbs (12 kg) and consumes a mere 145 W. JVC's display engineering team succeeded in developing a new, slimmer backlight unit by optimizing the light-diffusing plates and light-reflection sheets, as well as improving its overall composition. This provided uniform light-diffusion at all the corners and edges without the addition of more CCFL tubes, while maintaining adequate luminance to ensure that the screen always remains bright. The models will be available in early summer. Prices will be announced at that time. http://www.jvc.com

Samsung supports A-VSB mobile TV

Samsung Electronics provided several updates at CES 2008 on the progress of Advanced-VSB (A-VSB), its proposed mobile television standard. Samsung, which has been developing A-VSB as an open standard in the Advanced TV Systems Committee (ATSC) since December 2005, said that it remains on schedule for completion and availability by February 2009, in time for the US transition to all-digital broadcasting. To exhibit this progress tangibly, Samsung unveiled prototypes for A-VSB-enabled mobile phones, MP3 players, portable media players, UMPCs and notebooks. Samsung demonstrated live real-time broadcasting to a handheld device for the first time last year at CES 2007 and is demonstrated improved A-VSB performance at CES 2008. A-VSB can be transmitted over current TV frequencies without harming reception on today's TVs, allowing consumers to access both live mobile TV and interactive services built on A-VSB technology. http://www.samsung.com

Samsung shows 40-inch LCD module only 1cm thick

At the FPD International show in Yokohama last fall, Samsung Electronics showed of a 40-inch Full HD LCD panel that measured only 10 millimeters thick. Moreover, its bezel has been reduced from a conventional 30mm to 14.6mm. The panel, using an LED backlight, reproduces 92% of the NTSC color saturation curve.
http://www.samsung.com

Samsung claims contrast ratio of LCD TVs to 500,000:1

Samsung released new LED-backlit LCD displays, which are expected to increase the contrast ratio of LCD TVs by a factor of 20. According to the manufacturer, the new panels enable a jump in the dynamic contrast ratio from a typical 5000:1 and 25,000:1 in today's LCD TV panels into a range between 100,000:1 and 500,000:1. The displays are available in 40, 46, 52 and 57-inch diagonal screen sizes and promise the "clearest images on the market today" in what Samsung calls "premium LCD TVs". The panels are using a new LED technology described as local dimming similar to that of BrightSide Technologies' high dynamic range technology – now in the Dolby stable. "Hundreds of wafer-thin diodes about the width of the eye's pupil are electronically turned off and on in exacting sequences that respond to movement on the screen, areas only a fraction of what was previously possible with the most prevalent form of TV backlighting – long, thin fluorescent lamps. In black areas of the picture, the diodes can be completely shut off in order to generate total blackness," Samsung explained. Depending upon the number of LEDs used in a screen panel design, the dynamic contrast ratio can improve the contrast in colors by as much as 1000% over the CCFL (cold cathode fluorescent lamp) LCD TVs typically used today, according to the manufacturer. Samsung said that its "extreme-contrast LCD panels" are now available in Samsung TVs in the US. Samsung expects other manufacturers will adopt the technology for their future HDTVs. http://www.samsung.com

Genoa Color announces US patent for multi-primary color LCD display technology

Genoa Color Technologies has been granted a patent by the United States Patent and Trademark Office (7,268,757) for "Device, system and method for color display" for an LCD display using multi primary colors. Genoa's Multi Primary technology uses more than three primary colors in the display. In addition to the traditional RGB, other colors are added - such as yellow and cyan. Multi primary is the only technology that allows LCD displays to fully cover cinema gamut. "Increasing the NTSC ratio is not enough, Genoa's unique solution increases the gamut in both yellows and cyans, which is unattainable using wide gamut CCFL or LED backlights," says Dr. Shmuel Roth, VP Technologies. Genoa's solutions support the emerging wide gamut standards, such as xvYCC, and also increases luminance efficiency without sacrificing color performance in mobile LCD displays, resulting in longer battery life. http://www.genoacolor.com

Viewsonic's new VTV Division introduces eight new LCD TVS

At CES 2008, ViewSonic announced the first high-definition LCD TVs to be introduced from its newly formed VTV division, which leverages the company's experience in the desktop computer display market to deliver technology, performance and value in the highly competitive TV market. The introduction of the new 30 Series and 90 Series NextVision LCD TVs is focused on a sleek design with high-quality color. The widescreen 30 Series, which includes the 15.6-inch N1630w, 19-inch N1930w and 22-inch N2230w, is targeted at consumers seeking dual purpose HDTV/PC displays for smaller living spaces. In addition to the glossy black bezels, The 30 Series provides HD digital video content through an integrated ATSC/NTSC/QAM TV tuner, and comprehensive inputs including component video "S," composite video and an HDMI port. Interestingly, each model in the 30 Series comes at a different pixel format: The N1630w features 1366x768 pixels (16:9 aspect ratio); the N1930w is at 1440x900 pixels (16:10 aspect ratio), and the N2230w is at 1680x1050 pixels (16:10 aspect ratio). The 90 Series LCD TVs includes the 26-inch N2690w, 32-inch N3290w, 42-inch N4290w, 47-inch N4790w and 52-inch N5290w. All five of the TVs feature built in ATSC/NTSC/QAM TV tuner and precision 3D comb filter with motion adaptive de-interlacing, HDMI 1.3 and digital noise reduction to deliver consistent, high-quality digital video pictures.   In addition, the 90 Series TVs up to 47-inchs feature a swivel base so the screen can be easily adjusted and viewable from more angles. ViewSonic says the N1930w and N2290w will be out in March, the N1630w and N3290w will be out in April, and everything else will hit in May, with prices ranging from $249 to $2,499. http://www.viewsonic.com

Sharp sells 10 millionth LCD TV in Japan market; announces 20 new AQUOS models

On January 24, Sharp announced plans to successively introduce into the Japanese market 20 new AQUOS models in three series with screen sizes ranging from 20- to 52-inches by March 1, 2008. All AQUOS models in the new X Series, E Series and D Series feature LCD panels manufactured at Sharp's Kameyama Plant. These panels are based on Sharp's proprietary Advanced Super View LCD that improves viewing in bright conditions. All models also support AQUOS Familink that enables easy control of connected audio/video equipment. Sharp advised that total sales in Japan of AQUOS LCD TVs, which first made their debut as the "TV for the 21st century" in January of 2001, have now exceeded 10 million units.

In late January, Sharp announced plans to introduce 20 new LCD TVs ranging in size from 20- to 52-inches.

VIZIO announces expansion of VW Series of LCD HDTVs

In early January, VIZIO announced their 2008 VW Series of LCD TVs, designed for and distributed by discount retailers including Wal-Mart. The expanded product line includes a range of models from 19-inches to 46-inches. Priced under $2000, both the VW42LF and VW46LF models offer full 1080p resolution. The VW Series now consists of the VW19L, VW22L, VW26L, VW32L, VW37L, VW42LF and VW46LF. The VW19L and VW22L are new additions to the line, offering two compact models that can double as computer monitors or dedicated displays for game consoles. The VW42LF is an upgraded 42-inch model that now offers full 1080p HD and the 46-inch VW46LF extends the line further in a full 1080p HD model. The two top-end models, the VW42LF [42-inch] and the VW46LF [46-inch], come with three HDMI v1.3, two component, composite and RGB connections and all black bezel construction. Each model includes a standard/HDTV/QAM combination tuner, closed caption, 3D Comb Filter, and 178-degree viewing angle. The new VW42LF and VW46LF also detachable bases and will come out at estimated selling prices of $1349 and $1749 respectively in the May/June time frame. http://www.vizio.com

Syntax-Brillian showcases 120Hz and Full-HD technology

At CES 2008, Syntax-Brillian showed off a diverse range of new Olevia LCD HDTVs featuring the latest in display technology hardware and feature enhancements combining 120Hz Motion Estimation/Motion Compensation (ME/MC) technology from Micronas with full-HD 1080p resolution, new industrial designs and firmware upgradeability via USB. The new full-HD 1080p Olevia LCD HDTVs were introduced at 42-, 47-, 52-, 55- and 65-inch sizes. The new Olevia product line is comprised of the 2 Series, a competitively-priced true mainstream LCD HDTV, plus the Olevia 6 Series which offers premium quality with the latest features and additional inputs, and the best-in-class Olevia 7 Series. Some Olevia LCD HDTVs also incorporate new features that provide for enhanced user experiences including additional HDMI inputs and two USB ports. Users of theses Olevia models will be able to utilize these inputs not only to connect the TV to home entertainment equipment easier, but also to connect USB thumb drives or PCs to their TVs to install firmware upgrades, and use the TV to display photos or play MP3 music files through a home theater audio system. http://www.syntaxbrillian.com

English men pick HDTV over sex

According to a mid-February report revealed by Reuters, nearly half of British men surveyed by a CE retailer in London stated that they would give up sex for six months in return for a 50-inch TV. Comet, the retailer in question, said it quizzed about 2,000 male and female about what they would give up for a large television. In results perhaps not too surprising coming from a merchant eager to sell large-screen HDTVs, Comet found that 47 percent of men would give up sexual relations for half a year – compared to just over a third of women surveyed. A quarter of people said they would give up smoking, with roughly the same proportion willing to give up chocolate. Comet couldn't overcome the temptation to sum up its survey by simply stating, "It seems size really does matter more for men than women."

Westinghouse Digital reaches 8 million viewers-per-month with PumpTop TV

Westinghouse Digital announced that the company has completed deployment of Westinghouse gas pump TV systems in four major demographic areas on the West Coast, reaching over 8 million viewers per month. The company has installed 3,500 specially-designed LCD screens as part of Adtek Media's PumpTop TV network in major brand gas stations in Los Angeles, San Diego, San Francisco and Sacramento. The installations are part of the company's previously announced commitment to build systems throughout the U.S., including networks in Phoenix, Dallas, Houston, New York, Chicago, Philadelphia and Boston in 2008. The PumpTop TV network features daily news, weather, sports and entertainment programming and real-time traffic data from multiple media partners, including ABC News. The PumpTop TV network is part of Westinghouse Digital's larger, longer-term commitment to combine purposed content with unique hardware designed to reach viewers in specific situations. Westinghouse gas pump TV systems reflect integration at the manufacturer level – with full manufacturer support – to address the unique functional needs of outdoor displays intended for viewers pumping gas. PumpTop TV uses customized 19-inch Westinghouse displays to provide drivers an engaging diversion during their five minutes of fueling time. PumpTop TV also offers a unique screen layout which displays news and advertising simultaneously. This format provides a more compelling consumer experience in the gas station environment and offers content owners and advertisers multiple areas of "real estate" to deliver programming and messaging. http://www.westinghousedigital.com

HP and Sony Pictures Home Entertainment announce on-demand DVD licensing agreement

HP and Sony Pictures Home Entertainment announced in late January that SPHE will license select catalog titles from its home video library for production and distribution via HP's DVD manufactured-on-demand service. This agreement makes Sony the first major Hollywood studio to present its home video titles using HP's service. The list and availability of SPHE titles to be licensed through this agreement has yet to be finalized. HP's manufactured-on-demand service is used to produce a DVD of any movie, TV show or other video content, regardless of niche or obscurity. Content currently being targeted for release includes classic and older TV shows never before released on DVD, foreign movies, productions for specialty genres such as religion, education, lifestyle, health, food and sports, specialty cable TV programming, independent movies, and recently broadcast TV shows and sporting events with high relevancy in specific geographic markets or within specific consumer segments. The service is a component of HP Digital Content Services, which helps retailers fulfill the requests of customers wanting video content in various forms, including digital downloads, traditional packaged DVDs and emerging video formats such as HD DVD and Blu-ray discs. http://www.sonypictures.com http://www.hp.com

Apple releases Apple TV upgrade

Apple released an Apple TV software upgrade that allows people to rent movies from Apple's iTunes online music store directly from their TVs. For Apple TV owners, version 2.0 is installed automatically as the device, which streams video content from a Macintosh or PC to a digital television, periodically checks for upgrades. To receive the update, the Apple TV has to be connected to the Internet. Apple chief executive Steve Jobs said during his MacWorld keynote last month that Apple TV 2 would be ready by the end of January. The company, however, delayed the release by a couple of weeks, saying it needed time to finish the upgrade. The software update will allow people to rent movies from Apple's iTunes store using a remote control. Apple expects to have more than 1,000 movie titles available by the end of February, including more than 100 high-definition titles. Apple's catalog represents only a tiny portion of the movie libraries of the six major studios that have agreed to make films available on iTunes. The studios include 20th Century Fox, Warner Bros., Walt Disney, Paramount, Universal, and Sony. New films will not be available on iTunes until 30 days after they ship to retailers on DVD. The delay is so the electronic release of a movie does not usurp sales for retailers, such as Wal-Mart, which account for the majority of DVD sales. DVD-quality movies are available to rent on iTunes for $2.99 for older titles and $3.99 for new ones. High-definition versions cost a dollar more.

QuickPlay Media improves viewing experience for full-length mobile TV and movies

QuickPlay Media announced the release of a new set of features for its OpenVideo 4.0 platform. The new features transform the mobile customer experience by enabling mobile operators to offer consumers full length content – including movies and TV. The first mobile carrier implementation of the feature set will occur in Q1 of 2008. The growing availability of advanced mobile devices with larger screen sizes and the mobilization of movie and TV content have led to increased interest among consumers in viewing movies and TV on their hand-held devices. However, in many instances, consumers do not have time to watch a full-length TV show or movie in its entirety. Additionally, a segment may be interrupted due to a network failure. In both of these instances existing WAP or other mobile client-based services force users to start again from the beginning of the program when they resume viewing. The new features address this issue with a "resume playback" option that enables customers to stop the program and then pick up where they left off. Another advanced feature is a powerful search capability that allows customers to look for particular content within a segment.http://www.quickplay.com

ICO and Alcatel-Lucent demonstrate first mobile DVB-SH TV broadcast in North America

ICO Global Communications and Alcatel-Lucent demonstrated North America's first video broadcast based on the DVB-SH (Digital Video Broadcasting – Satellite services to Handhelds) mobile broadcasting standard at the Consumer Electronics Show. This demonstration is a key milestone for ICO's initiative to deploy a fully-integrated DVB-SH hybrid satellite/terrestrial network in North America. Alcatel-Lucent, as the end-to-end network integrator for the project, is supplying the system architecture, design and installation for the network. In the demonstration, ICO and Alcatel-Lucent delivered mobile high-resolution live television programming to display terminals located in a moving vehicle outfitted with DVB-SH receivers. In addition, ICO demonstrated high-resolution DVB-SH video reception by delivering pre-encoded content to portable monitors in ICO's exhibit suite. http://www.ico.com

SiBEAM announces availability of world's first WirelessHD chipset

SiBEAM, Inc. announced that its WirelessHD-based transmitter and receiver chipsets, built in affordable CMOS, and its WirelessHD Development Kit will be made available to select customers in the first quarter of 2008. Delegates of the 2008 International Consumer Electronic Show (CES) in Las Vegas saw the world's first WirelessHD solutions with OmniLink60 technology from SiBEAM. These chipsets are recipients of the CES 2008 Best of Innovations Award in the Enabling Technology category. http://www.sibeam.com

HD VMD now shipping in the US

New Medium Enterprises (NME) announced in early January that HD VMD players are shipping into the US market. HD VMD is delivering 1080p players to consumers for $199 via PCRush.com and NMEStore.com. All orders for HD VMD players in January will come with two complementary titles, "Mother Ghost" starring James Franco and cult hit "Cutting Room." HD VMD is based on a patented multi-layer disc, (up to 30GB) which allows for the utilization of red laser technology to provide high definition, versus blue laser technology that competitors are forced to use due to disc space limitations. With only one laser (red), HD VMD players can upconvert existing DVD collections for better viewing quality, as well as play true high definition content. NME also this week announced its worldwide distribution deal with SFM Entertainment for the release of rare and classic film and TV titles never before seen in HD on NME's disc format. VMD players are also currently shipping to Australia and Europe. http://www.nmeinc.com

### Sony develops holographic disks to store 500GB

Sony announced that it will release a multi-layer optical disk that can store more than 500GB of data. The holographic recording technology will have seven layers and produce standard-sized 12 cm disks. The multi-layer holographic disk will reportedly be available within the next three years. Sony is using its "Micro-Reflector" method to write to seven layers per disk. The memory density per layer is 1.2 GB and the maximum error rate is 4.1×10^{-4}.

Displaybank reports Chinese LCD TV market to grow 54% in 2008

On February 19, DisplayBank predicted that the Chinese LCD TV market will grow to 15.50 million units, exceeding prior market estimates. In 2007, the Chinese LCD TV market reached 10 million units in unit volume, but in 2008, volumes are expected to surge to 15.50 million units -- a steep growth of 54%. Thus, China is predicted to account for almost 15% of the worldwide total. Displaybank researchers further predicts that the Chinese LCD TV market will continue its torrid growth through 2011 showing a compounded annual growth rate of about 36.5% and reaching about 35 million units. http://www.displaybank.com

Chinese LCD market forecasts

(Million units)	2007	2008	2009	2010	2011	CAGR
LCD TV	10.1	15.5	21.3	27.8	34.9	36.5%
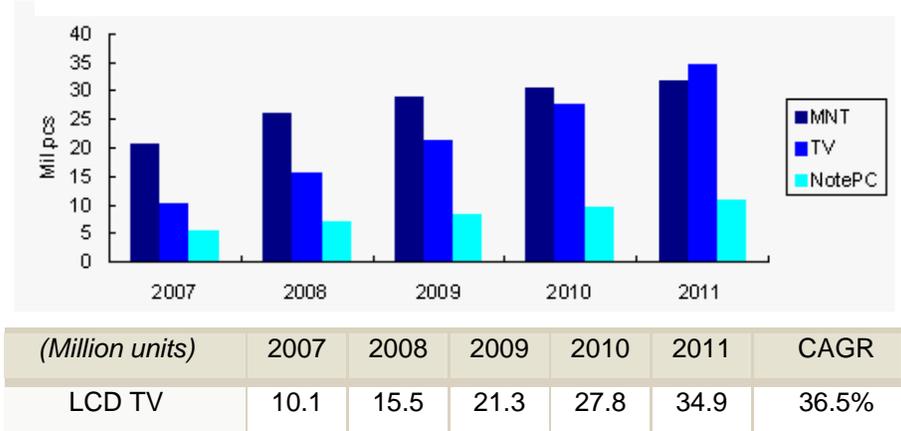
Pacific Media Associates says December HDTV sales jumped 27%

In mid-February, Pacific Media Associates reported that unit sales for flat panel HDTV televisions in North America grew by 27% in December over November's sales, marking a seasonal sales surge for the end of the year. Their Consumer Flat Panel Display Sell-Through Tracking Service also shows that consumers moved toward buying larger size models. "One important development in December was that plasma models continued to lose ground to LCD," according to Rosemary Abowd, Vice President with Pacific Media. "LCD already dominates the market below 45", but in December, LCD took 50% of the larger 50- to 54-inch size segment. Plasma's unit share dropped to 17% in December, which is its lowest point in the history of our sample. We have not seen the impact of the new, larger capacity LCD plants that will start to come online later in 2008, which should only increase LCD's competitive position in the larger sizes." The average street price for all units sold in December in the report sample declined by just 1% over the average for November. This result might appear to be in conflict with the result that 17 of the top 20 best-selling units fell by as much as 10% or more from November's pricing. The 1080p 45-49-inch LCD segment average price fell by 10%, and was second behind 1080p 40-44-inch LCD as the most popular segment on a unit basis. The conclusion from this is that consumers took advantage of lower prices to step up to larger sizes than they bought in November. Samsung had seven of the top ten best-selling models in December, including the top selling LNT4661F 1080p 46" LCD HDTV with an average street price of $1,531, down 15% from its November price. This helped drive Samsung to the top spot in both unit share with 29.6%, and revenue share with 32.2%.

Quixel Research reports that 1080p growth drove 2007 LCD TV market

On February 11, Quixel Research revealed that sales for the 40-45-inch LCD TV segment increased almost 300 percent from 2006 to 2007, while the 45-50-inch LCD TV segment increased almost 400 percent for the same time period. "The 32-inch screen size won't be the sweet spot in the marketplace for much longer," stated Tamaryn Pratt, Quixel Research's Principal. "As fab capacity continues to increase, LCD TV unit sales of the 40-inch and 42-inch models will soon outpace 32-inch sales. In 2007, the combined unit sales of the 40-47-inch models already topped the 32-inch segment in unit sales. This was great news for large screen manufacturers; because 1080p is so dominant in the screen sizes above 40-inch, value for the combined 40-47-inch models more than doubled the value for the 32-inch segment for the year." Full HD sales escalated swiftly in the fourth quarter when LCD TVs 40-inch and above were three times as likely to be 1080p. Overall unit sales for the LCD TV category were up 74 percent from 2006 to 2007 and up 39 percent from Q3 2007 to Q4 2007. In value, the LCD TV category generated $19.9B in revenues for 2007 or up 74 percent compared to 2006 results of $11B. The total value of the Advanced TV market in the USA was worth almost $28.7B in revenues in 2007 and $9.6B in Q4 2007. The LCD TV segment represented almost 70 percent of that market in 2007. Quixel Research's projections for the USA LCD TV market show the category close to tripling in volume by 2010. http://www.quixelresearch.com.

Nielsen survey reveals HD households satisfied with image quality, but unhappy with HD content

In a survey of some 511 HD households, Nielsen recently found that 85% thought the picture quality of their HDTV sets was either above average or excellent. But only 39% of these regular HD viewers gave the same rating to the available selection of HD programming. Nielsen senior vice president Steve McGowan said viewers' relative unhappiness with HD-programming choices could be attributed to the heavy promotion of new HD channels on their standard-definition counterparts. While the new channels being rolled out this fall by satellite and cable operators might be frequently promoted during primetime viewing, they are often not carried by HD viewers' cable or satellite providers. Not surprisingly, Nielsen found that sports and movies were the most popular HD programming, as 42.8% of respondents said they watched HD sports and 38% tune into movies, followed by scripted dramas (28.1%), documentaries (23.8%), scripted comedies (19.4%), reality programming (11.1%) and music (9.6%). ESPN HD scored as the most-watched source of sports programming, and HBO led in the HD-movie category. CBS HD was the most-watched network for HD scripted dramas, as well as comedies. Discovery HD Theater was the most popular network for documentaries, and it also ranked first for picture quality, ahead of CBS HD and NBC HD, which tied for second. Fox HD led in reality, while PBS led for HD-music programming. The survey also showed that most viewers get their HD signals from cable or satellite, just as they did in the analog, standard-definition world. A total of 60% of respondents get HD cable service, while 31% get their HD from satellite. Only about 6% indicated that they received HD signals through an over-the-air antenna (the remaining 3% of respondents didn't know who provided their HD programming or wouldn't say).

Leichtman Research Group report points to 30 million HD households in US

There are close to 30 million US households today with a display capable of showing HDTV, according to the Leichtman Research Group. Leichtman's latest study of HDTV penetration, based on a survey of 1,300 households across the country, indicated that about 25% of US households own at least one HDTV, which would equate to some 28 million sets based on Nielsen Media Research's total US TV-household number of 112.4 million. Leichtman's figures are lower than estimates from the Consumer Electronics Association, which said that HD household penetration stood at 32% in July, or some 36 million homes. But it's much higher than estimates from Nielsen, which said only 23.6 million US households, have HDTVs. http://www.leichtmanresearch.com

BEF/DBEF film demand to rise to $3.3 billion in 2011, predicts McLaughlin report

The upside forecast for all sales of brightness enhancement light management films is nearly 11% annual growth to $3.3B in 2011, according to a new report by McLaughlin Consulting Group. The forecast covers prism film (BEF), reverse prism film, polarization recycling film (DBEF) and the newly emerging brightness enhancement diffusers. Sales of these light management films (LMF) will be propelled higher by rapid growth in demand for LCD panels, increasing penetration of LED backlights for laptops, and smaller declines in pricing for CCFL lamps. The forecast also includes an expected case forecast of 6% annual growth, to nearly $2.9B, in 2011. In the expected case LCD panel sales are slower, penetration of LED backlights is more gradual, and pricing for CCFL lamps declines faster. As MCG forecast in the 2006 BEF/DBEF report, with the expiration of 3M's key patents in prism film (BEF), 3M has come under siege by a host of competitors offering prism film at lower prices. 3M's market share in BEF (prism film) for monitors has already fallen below 50% in 2007. 3M's market share in prism film is forecast to drop dramatically by 2011. While prism film sales will grow rapidly in area terms, total sales will fall in dollar terms as price declines will outpace volume growth. While the total BEF-type market will shrink in dollar terms, competitors to 3M will see rapid growth as 3M fights a rearguard action in this segment. Sales of polarization recycling film (DBEF) are being buoyed by the irreplaceable need for this film in larger LCD TVs to make the problem of heat build-up in the backlight more manageable. Either DBEF with a prism film, or DBEF alone are the preferred alternatives for large TV applications. 3M is forecast to come under attack in its sales of polarization recycling film (DBEF) in 2009 as new technology for polarization recycling is expected to begin production. http://mcgweb.com/reports/bef2007.htm.

Luxtera showcases optical interconnect

On January 7, Luxtera announced its demonstration of the world's first DisplayPort optical interconnect based on its breakthrough Silicon Photonics technology. Luxtera showcased its long reach optical solution for digital home and digital signage applications. By utilizing Luxtera's technology, customers will be able to deploy high resolution displays, such as 4K2K, at distances from 2 meters to 4 kilometers. By combining optical and electronic elements on a single silicon CMOS chip, Luxtera is the first company to break cost barriers of traditional optics and economically deliver high performance optical interconnect to mainstream markets. http://www.luxtera.com

Luxtera samples world's first 40-gigabit optical active cable

Luxtera announced that it is the first company to sample a 40-gigabit optical active cable (OAC), the Blazar. Luxtera's OAC is now available to customers following its demonstration at the International Conference for High Performance Computing – SC07. The product is suited for InfiniBand and Ethernet applications in High Performance Computing (HPC) clusters and data centers. The CMOS photonics technology uses a single die for what has traditionally been implemented using multiple components. As a result, Blazar breaks paradigms of traditional optics by delivering a low cost, long reach and highly reliable solution that will change the landscape of data centers, the company says. Data centers and HPC clusters will gain 2x throughput and 3x reach using Blazar versus existing optical active cables. They will also gain 4x density improvement with one QSFP connector taking the same space as four XFP connectors. http://www.luxtera.com

Gore and Quellan collaboration yields new portfolio of active copper interconnects

W. L. Gore & Associates (Gore) and Quellan Incorporated demonstrated a broad range of new GORE Extended Reach Cable Assemblies. The new "active" cables deliver extended reach over thinner, lighter copper cabling for high-performance computing (HPC), enterprise server and storage applications. The cables are designed to address numerous next generation protocols such as InfiniBand, 10GbE and 8G Fibre Channel. The family of new products is constructed with advanced GORE EYE-OPENER+ conductor technology, which provides distributed equalization to minimize signal degradation, and integrates Quellan Q:ACTIVE silicon technology that reduces jitter, crosstalk and other signal impairments. When using this cabling technology, a system can carry up to 480 Gbps of bandwidth to and from a single 1RU rack at distances of up to 15 meters. GORE Extended Reach Cable Assemblies eliminate the need for power hungry and expensive optical interconnects while improving data center reliability. For supercomputer applications, the companies showcased the industry's first active 12x DDR InfiniBand cable, carrying 60 Gbps over 10 meters in a single link and measuring just 8 mm in diameter. For high density data center switching, the companies demonstrated the industry's first active QSFP cable handling 35 Gbps of data over 15 meters. For high-density blade servers and stackables, the companies demonstrated the industry's first active SFP+ cable reaching 10 meters. http://www.quellan.com

Broadcom announces high definition AVC encoder/transcoder

Broadcom Corporation announced the industry's most advanced high definition (HD) AVC/MPEG encoder/transcoder that enables the personal computer to function as a multimedia gateway in the connected home. The new Broadcom single-chip system-on-a-chip (SoC) solution enables users to transfer audio/video content in real-time across several classes of consumer devices to and from the PC. Additionally, the SoC allows for advanced video editing and compression on the PC, enabling personal video recorder (PVR) and camcorder functionality, video conferencing and support for other audio/video applications that users may desire in the future. The Broadcom BCM70020, provides the foundation for personal computers that support H.264/AVC, MPEG-2 and MPEG-4SP, as well as home entertainment and network applications. It furthers the advancement of real-time HD media encoding and transcoding by providing digital rights management and enhanced hardware based security that is important to content providers such as movie studios, broadcasters, record labels, etc. Designed in a 65 nm CMOS process, the BCM70020 provides lower power consumption, smaller footprint size and higher levels of integration and functionality than other CMOS processes. http://www.broadcom.com

New connectivity solutions from Gefen support next-generation HDMI v1.3 signals

Gefen's newest extension, integration, and distribution solutions are equipped to manage the expanded HDMI v1.3 format, delivering enhanced functionality with long-term performance. The 4x1 switcher gives one display or projector access to four always-connected sources, including satellite set-top boxes, disk players and games; the 3x1 switcher gives one display access to three sources. Source selection is controlled by IR remote or local panel buttons. HDCP-compliant video up to 1080p resolutions with eight channels of digital audio is supported on both units. The 1:10 distribution amplifier accepts one high definition audio/video signal and delivers it to ten remote destinations where displays can be extended up to 150 feet from the source over CAT-5 cable. The 1:5 distribution amp offers delivery of one signal to five remote displays. HDCP compliance and high definition resolutions are supported up to 1080p. http://www.gefen.com

Gefen and Pulse~LINK introduce first consumer HDMI-Over-Coax product

Gefen and Pulse~LINK introduced the world's first consumer electronics product that incorporates Pulse~LINK's CWave UWB HDMI-Over-Coax technology. For the first time, consumers will be able to extend the reach of HDMI from room to room over their existing in-home coax cabling. Gefen and Pulse~LINK demonstrated the technology at the 2008 International Consumer Electronics Show. The Gefen HDMI Over Coax Extender provides an infrared back channel that enables consumers to use the same remote that controls their set-top box, DVR, Blu-ray or HD-DVD player, in all rooms throughout the connected home. The no-new-wires solution offers Gigabit data rates and is capable of simultaneous delivery of high quality, visually lossless video along with multi-channel digital audio. The Gefen HDMI-Over-Coax Extender is planned for release in April 2008 and will be available to consumers online at http://www.gefen.com or through an authorized Gefen reseller.

ST Micro develops three-input active HDMI switch to support 3.4Gbps data rate

STMicroelectronics announced the first HDMI (High-Definition Multimedia Interface) switch in the world to support a video data-transfer rate of up to 3.4 Gigabits per second (Gbps), enabling full 16-bit color depth - 65k colors - to be maintained for a true high-definition (HD) picture. The STDVE003A is designed to be used in LCD and plasma TV sets to provide multiple HDMI inputs for external program sources, such as game consoles, high-definition DVD players (Blu-ray and HD-DVD), and set-top boxes (STBs). In addition, its integrated equalizer is designed to overcome signal degradation when long (greater than 20 m) and lossy cables are used.

The STDVE003A is an active digital multiplexer designed for high-performance TMDS (Transition Minimized Differential Signaling) data transfer. Configured as a 3:1 switch, it enables TV designers to provide as many as three input ports while using only a single HDMI receiver chip. Signal integrity is maintained and enhanced by an internal active block, which receives and equalizes the input signal before transmitting it to the next stage. The device is produced using ST's advanced BiCMOS6G SiGe process technology. http://www.st.com

RedMere Technology demonstrates 3.4Gbps low power HDMI embedded cable

RedMere Technology demonstrated the RM1689 Cable MagnifEye product at the Consumer Electronics Show in Las Vegas. The RM1689 is an ultra low power semiconductor device that performs adaptive equalization and advanced cable de-skew to achieve unprecedented HDMI performance levels over low cost, narrow-gauge HDMI cabling. The RM1689 is embedded within the HDMI connector and enables the 3.4Gbps operation required to pass the rigorous v1.3 testing for CAT2 cables compliance. The use of a patented "Zero Power Active" technique together with the ultra low power RM1689 architecture enables these performance levels to be achieved without requiring external power. The use of thin flexible HDMI cabling is particularly attractive to manufacturers of consumer devices such as gaming consoles, digital cameras and portable AV products. http://www.redmere.com

HDMI Licensing launches programs for home theater installers

At the 2008 International Consumer Electronics Show (CES), HDMI Licensing, the agent responsible for licensing the High-Definition Multimedia Interface specification, announced the launch of a suite of tools and educational programs specifically designed to help the installer community more effectively install home theater systems that are connected with HDMI. The new tools and programs include a dedicated web-based installer area on the HDMI Licensing website, featuring new webinars hosted by HDMI Licensing developed specifically for installers, and a new, easily accessible Knowledge Base that provides installers with tips and answers to help solve installation issues and questions. The new installer section can be found at: http://www.hdmi.org/installers

OnChip Devices introduces ultra low-capacitance integrated ESD protection chip for HDMI
OnChip Devices announced the industry's lowest capacitance ESD protection chip to support the HDMI 1.3 specification. The High-Definition Multimedia Interface is the standard digital interface for high-definition consumer electronics, adopted by more than 700 companies worldwide. Available immediately, OnChip's highly integrated solution provides a high-level of ESD protection, and is designed to support the latest HDMI 1.3 specification, as well as previous standards such as HDMI 1.2. The OnChip ESD2100 offers ultra-low line capacitance to ensure high signal integrity for video formats such as 1080p. The ESD2100 chip delivers up to 8 kV of ESD protection in contact discharge per IEC61000-4-2 standards for up to 8 channels. Total line capacitance for the chip is as low as 0.6 pF, with excellent capacitance matching of less than 0.05 pF for TMDS pairs. http://www.onchip.com

California Micro Devices introduces new ESD architecture for high-speed interfaces
On January 28, California Micro Devices introduced PicoGuard XS, a new ESD (electrostatic discharge) protection architecture in its XtremeESD family, the industry's first product to provide both outstanding signal integrity and robust ESD protection for high-speed differential signals such as DisplayPort and HDMI. By integrating inductors with the ESD protection diodes, the PicoGuard XS architecture eliminates the need for external compensation to match line impedance, reducing design complexity and cost. The first PicoGuard XS product is the CM1233-08DE, offering eight channels of robust ESD protection. It provides protection for four pairs of differential channels, offering ESD protection to IEC61000-4-2 Level 4 ±8kV contact discharge. The integration of inductors with the ESD diodes provides for improved ESD protection as well as better signal integrity. The CM1233 is available in a 16 lead TDFN package. It is currently sampling and will be in full production this quarter. It is priced at $0.57 each at 1,000 units. http://www.cmd.com

Analog Devices develops networked entertainment reference design
According to Analog Devices, the rapid growth of high-definition (HD) home entertainment systems has made the connections between an increasing number of sources and displays more difficult. HDMI cables support a limited distance, and content protection restrictions preclude most of the traditional interconnect solutions. Several approaches have been proposed, but Analog Devices' HDAnywhere networked entertainment solution is the only one that works with any source, over any common transport. It enables connections to wall-mounted displays without cables, ceiling mounted projectors without putting wires through the walls, and televisions in other parts of the house without running any new wires. HDAnywhere is based on ADI's Wavescale compression which provides unique advantages in video quality, transmission robustness, scalability, low latency, and instantaneous data rate adjustment. The HDAnywhere system compresses video in real time, encrypts the stream, and provides it to a UWB, WiFi, powerline, phoneline, or COAX modem – all without visual interruptions. The receiver decrypts and decompresses the stream and produces an HDMI output, ready to be connected to any HD display. http://www.analog.com

New signal generator from Gefen trouble-shoots HDTV systems
Connectivity solutions provider Gefen announced the availability of the new Gefen TV signal generator. This solution is packaged under the Gefen TV prosumer brand, and is recommended for anyone installing, designing, and purchasing home theater systems. Designed for easy portability, this device enables real-time testing of all video displays and projectors operating with the HDMI format (or DVI if used with an adapter). Nearly 40 video testing patterns including HDCP verification, three audio testing signals, a sine-wave formation and 35 timing settings are accessible through the unit's LCD display menu. Users can navigate the Gefen TV signal generator's menu through the navigation buttons and easy to read LCD on top of the unit. Advanced users can download a Windows-based application for extra timing and programming controls, including reading/writing of EDID and favorite timing modes for the auto scroll feature. The unit comes equipped with supplemental RCA and TOSlink audio inputs in addition to the HDMI output, and supports the measurement of both standard and high definition video formats including PAL and NTSC. An overscan option is included when working with undersized video. http://www.gefen.com/kvm/product.jsp?prod_id=4720

DisplayMate brings out USB plug for product testing

DisplayMate has a new USB product for HDTV, projector, and computer monitor reviews, tests and evaluations. The DisplayMate USB plugs into to any Windows PC (including Vista) and it will launch automatically and generate a series of test patterns for general set up, calibration and visual evaluation. It's a tiny USB drive and no installation is needed (see photo). Most PCs now have DVI and HDMI outputs that connect directly to an HDTV so DisplayMate USB can be used for HDTVs in addition to computer and video projectors and monitors. It automatically generates native mode test patterns for any aspect ratio and resolution up to 4096x4096, including the 1366x768 resolution, which is the most popular current resolution for HDTVs. Nothing is copied or written to any drive on the host PC. http://www.displaymate.com

Siano launches next-generation mobile digital TV receiver chip

Mobile TV chip maker Siano Mobile Silicon announced today the launch of a new family of Mobile Digital TV (MDTV) receiver chips called the SMS1100. Following successful field trials in Europe, Japan and Korea, the SMS1100, a single receiver chip, notably supports reception of ISDB-T TV signals, the broadcast standard of Brazil and Japan, in addition to Siano's existing portfolio of DVB-H, DVB-T, DAB, DAB-IP and T-DMB. Siano is the only mobile TV chip maker that provides a global footprint of mobile TV "coverage" on one single chip – including Russia, Western Europe, Korea, Japan, South East Asia, and Brazil, with further developments expected in China and the US. http://www.siano-ms.com

Sunplus and Ocean Blue collaborate to develop interactive mobile TV platform

Sunplus Technology and Ocean Blue Software, the UK-based digital TV software specialist, have collaborated to develop a portable Freeview DVB-T platform with full interactive features. The new development will provide "red button" functions such as text services and access to alternative video streams in Freeview DVB-T TVs, for use in cars and trains, for example. Sunplus worked with Ocean Blue to port its MHEG-5 software onto Sunplus' SPHE1002 series chipset, which has low power consumption, ensuring good battery performance, essential in mobile devices, as well as static applications. The chipset, with both backend MPEG decode SPHE1002 and front-end demodulator SPDC210/230, also features fast channel scan and good echo performance, also critical factors for mobile devices. http://www.sunplus.com

SISVEL announces development of DVB-H patent pool

SISVEL announced that it is acting as the facilitator for the creation of a DVB-H joint patent licensing program and is issuing a call for patents and other enforceable patent rights that are essential to the DVB-H standard. SISVEL is organizing this joint licensing program to make DVB-H technology accessible to all users at fair, reasonable, and non-discriminatory terms and conditions. SISVEL invites all parties that believe to have a patent that is essential to the DVB-H standard and would like to join a patent portfolio license to submit their patent(s) for an evaluation of essentiality by the independent patent experts entrusted by SISVEL. Interested parties are invited to request information on the terms and procedures for patent submission by sending an email to SISVEL at the following address: dvbh@sisvel.com.

WirelessHD 1.0 specification launches with widespread industry support

WirelessHD, currently comprised of Intel Corporation, LG Electronics Inc., Matsushita Electric Industrial Co., Ltd. (Panasonic), NEC Corporation, Samsung Electronics, SiBEAM, Inc., Sony Corporation and Toshiba Corporation, announced it has completed the development of the first wireless specification for high-definition baseband video transmission and will present the format to adopters in early 2008. Additionally, since the October 2006 WirelessHD announcement, it has grown to include 40 early adopter and promoter companies as well as technical support with regards to content protection for WirelessHD 1.0 from the Motion Picture Association of America (MPAA) and technical support for DTCP content protection from the Digital Transmission Licensing Administrator (DTLA). WirelessHD or WiHD, is a wireless high definition digital interface standard operating in the unlicensed and globally available 60 GHz frequency band and represents the first consumer application of 60 GHz technology. It is suitable for a wide range of devices including televisions, HD disc players, set-top boxes, camcorders, gaming consoles, adapter products, as well as other source devices. http://www.wirelesshd.org

THX unveils Media Director and announces four partners

THX Ltd. introduced THX Media Director, formerly codenamed "Blackbird", to simplify home theater set-up and operation. THX Media Director will enable movies, music and other digital media to communicate picture and sound settings directly to consumer electronics devices, dynamically configuring them for the best playback experience. THX named four initial launch partners: Anchor Bay, Lyngdorf Audio, Portrait Displays, and Sequoyan Media Technology (SMT). THX Media Director self-configures home entertainment products based on metadata descriptors embedded on DVDs, CDs and downloads. This metadata can describe audio and video characteristics of digital content, including the appropriate surround sound formats and post processing modes for playback on AV receivers, and video aspect ratios, color temperature, brightness and sharpness for playback on HDTVs and DVD players. THX Media Director metadata is communicated to playback devices via an HDMI connection, which delivers the content and its descriptors, and enables the device to automatically select the appropriate playback settings on each device. Anchor Bay's DVDO iScan VP50PRO video processor will be one of the first HD video products to support THX Media Director. The Lyngdorf D-1 Home Theater Processor will be the first audio product to feature THX Media Director. Portrait Displays' TV Tune technology will aid in decoding THX Media Director metadata, triggering HDTVs to automatically adjust brightness, sharpness, aspect ratio and other video settings. THX has partnered with SMT to develop an external authoring tool to provide the postproduction community with a means to insert and verify THX Media Director metadata during the authoring of DVD, HD-DVD and Blu-ray discs. http://www.thx.com

THX and Portrait Displays partner to simplify HDTV setup and operation

THX and Portrait Displays have partnered to bring simplicity to HDTV setup and operation. The two companies announced that they will jointly market their new display technologies, THX Media Director and Portrait Displays' TV Tune, to the content creation and consumer electronics communities. The THX-Portrait Displays collaboration will allow digital media on DVDs, downloads, and broadcast channels to communicate directly with HDTVs, enabling these devices to select the appropriate settings and deliver an optimal playback experience. Portrait Displays' TV Tune, patent-pending technology, will play a significant role in the THX Media Director ecosystem, which spans the digital production chain — from the studio to the living room. THX Media Director turns movies, music, or video games into "smart content" that can communicate information about AV content directly to home entertainment products. Portrait Displays' TV Tune decodes this information, enabling the HD display to automatically adjust color temperature, brightness, sharpness, aspect ratio, and a number of other settings. http://www.portrait.com

Simplay Labs develops partnerships for CE control, 3D display and wireless HD

At the 2008 International CES, Simplay Labs announced that it is expanding its alliance partnerships with three leading digital entertainment solution companies. In conjunction with the launch of a new HD solution suite, Simplay Labs has signed letters of intent with Z-Wave developer Zensys, SENSIO Technologies and MET Laboratories to provide comprehensive consumer electronics control (CEC), 3D color display and wireless high-definition performance solutions enabling manufacturers to deliver products optimized for these features. Simplay Labs and Z-Wave developer Zensys announced their intention to collaborate to provide a comprehensive CEC solution incorporating Simplay Labs' CEC Solution Suite and Zensys' Z-Wave radio frequency (RF) remote control technology. Simplay Labs and SENSIO Technologies announced their intention to partner to develop and market comprehensive solutions for the rapidly emerging 3D home entertainment market. SENSIO's flagship technology, SENSIO3D, is a high definition decoder technology, which provides quality 3D with full resolution and full colors and also features JVC's real time 2D to 3D conversion technology. Simplay Labs will leverage its comprehensive HD performance testing and technologies solution suite, including development of performance, interoperability and testing specifications for 3D products, based on SENSIO's 3D technology. Simplay Labs will also use its HD technology suite to facilitate robust detection and easy operation of 3D CE components enabled with SENSIO's 3D technology. Both companies will be working with movie studios and other content providers, as well as with CE retailers. Simplay Labs and MET Laboratories have announced their intention to work together to develop solutions for the wireless high-definition marketplace, enabling manufacturers to deliver optimal wireless high-definition products to their customers. Simplay Labs is partnering with MET Laboratories to develop comprehensive solutions for testing, interoperability and performance specifications and the development of compliance testing and certification for wireless high-definition technologies. http://www.simplaylabs.com

Silicon Optix wins Emmy for video computer technology

Silicon Optix, a leader in advanced video processors, announced that the Academy of Television Arts & Sciences (ATAS) has awarded a Primetime Emmy Award for Outstanding Achievement in Engineering Development to the Teranex Video Computer by Silicon Optix. Based on the professional-grade Teranex video processing platform, HQV processing makes SD material approach HD quality by utilizing features such as advanced scaling, per-pixel detail enhancement and noise reduction that removes compression artifacts. HQV also delivers the sharpest, most detailed HD images by employing true 1080i-to-1080p HD deinterlacing and a sophisticated multidirectional diagonal filter that ensures video free from jagged edges. http://www.hqv.com

Hitachi, Canon and Matsushita reach basic agreement on LCD panel business

Hitachi, Canon and Matsushita Electric Industrial Co have reached a basic agreement on a comprehensive alliance aimed at reinforcing and growing the LCD panel businesses and technologies. Under this alliance, the three companies will merge their strengths to accelerate the development of cutting-edge display technologies and expand their scope of application. Hitachi possesses sophisticated liquid crystal-related technologies, including the In-Plane Switching (IPS) technology that enables outstanding color reproducibility and wide viewing angles. Moreover, it has been basically agreed by the three companies that Canon and Matsushita will, by transfer of shares from Hitachi, each acquire 24.9% of the shares of Hitachi Displays Co., Ltd., a wholly owned subsidiary of Hitachi engaged in small and medium-sized LCD panel-related businesses, by March 31, 2008. As a result, Hitachi's stake in Hitachi Displays is to become 50.2%. http://www.hitachi-displays.com/en/

LCD merger talks fail in China

Talks among three major Chinese LCD manufacturers makers hoping to create an international panel-making enterprise that could compete for a large market share of LCD monitors for HD sets and computers failed, with no new talks known to have been scheduled. The companies have been losing money on their LCD operations. Armed with the backing of China's communist government (which would have to approve any merger agreement), BOE Technology Group, SVA Electron, and Longteng had been in discussions over a possible merger for several months. But in separate statements on December 29, the firms said unspecified "technical obstacles" proved to be an insurmountable in achieving a joint agreement.

SPECTRONIQ 3-D introduces 3D HD LCD TVs

SPECTRONIQ 3-D Inc. unveiled its inaugural stereoscopic 3D HD LCD TVs in Las Vegas as the focal point of the company's presentation during CES. The company is ramping up for a summer 2008 nationwide retail launch for the 46-inch 3D TVs under the SPECTRONIQ brand, the first mass market consumer roll-out of its kind, the company claims. The sets were developed through an alliance between SPECTRONIQ 3-D and Kerner Optical Research & Development whose end-to-end 3D solutions form the SPECTRONIQ 3-D TV's primary technology suite. SPECTRONIQ 3-D has also announced an agreement with SENSIO Technologies to incorporate the Montreal-based company's 3D high definition decoder technology featuring JVC's real time 2D to 3D conversion technology, into KORD's 3D solutions suite. This will be the first time it will be integrated into a television intended for the consumer market. Technology firm RaisingSun Digital Video Technology is providing board systems solutions for the SPECTRONIQ 3D television sets. It is expected that other key partnerships will be made public in the near future. In addition to 3D LCD TVs, SPECTRONIQ 3-D is developing a 3D home theater PC for gaming and a laser HD television. http://www.spectroniq3-d.com/

DDD announces delivery of TriDef Core 3D display processor for LCD HDTV

DDD Group announced the delivery of the first TriDef Core embedded 3D image processor solution for 3D HDTVs. The new Hyundai IT 46-inch LCD HDTV incorporates Arisawa Manufacturing Company's Xpol 3D optical material and is being introduced in Japan to support the recently announced BS11 3D television programming from Nippon BS Broadcasting Corporation. TriDef Core is a custom circuit board that integrates with the existing 2D video electronics in the LCD HDTV. 3D features enabled by the TriDef Core processor include decoding the BS11 3D broadcast signal format, playback of specially encoded high definition Blu-ray Discs and real time 2D to 3D conversion of standard and high definition content. http://www.DDD.com

Pavonine showcases Miracube at CES

Pavonine Korea, Inc., a developer and manufacturer of 3D displays and 3D content creation tools in Korea, announced their new generation of 3D displays called Miracube. The monitors were featured at CES International 2008 in Las Vegas. Miracube 3D LCD displays feature a wide range of user options that make 3D viewing possible in the home. All displays can be switched between 2D and 3D, and incorporate a special 3D Formatter technology that is compatible with the major 3D content formats. Also, the 3D is completely flicker-free and keeps a high-resolution image. The viewers can also move around the screen without any restrictions. At CES2008, Pavonine Korea also presented its latest technological development, a new 3D display technology that will bring further improvements in brightness, viewing angles, viewing distance and simplicity of the manufacturing process. WGP (Wire Grid Polarizer) displays eliminate any limitations regarding the viewing angles, allowing the viewers to see a perfect 3D result. http://www.miracube.net

Missy Elliott creates first 3D music video

Walt Disney Studios created a stereoscopic 3D music video combining two of Missy Elliott's songs which will be featured in the studio's upcoming "Step Up 2 the Streets," which opened on February 14. MTV premiered the video in 3D on February 4. The video can be seen using anaglyph glasses. The video combines Elliott's songs "Ching-a-ling" and "Shake Your Pom Pom". In addition to the MTV premiere, the music video was also shown in 3D during a special screening of "Step Up 2 the Streets" on February 5 in New York, with Elliott in attendance. The video will also be shown in 2D. http://www.missy-elliott.com/chingaling.php

Sony offers TV recycling coupon

Sony Electronics, which launched a national electronics recycling initiative last September, introduced a program to further encourage consumers to recycle their old television sets. Sony will be offering shoppers a $100 coupon, good for the purchase of a Sony Bravia high-definition TV at Sony Style stores, online at http://sonystyle.com and through Sony Style telesales at (877) 865-SONY for every old set recycled through the Sony Take Back Recycling Program. The offer is good through March 15, 2008.

Philips Wins "Best in Show"' Award at CES for power-saving Eco TV

Philips' Eco FlatTV took home top honors at the 2008 International Consumer Electronics Show (CES) with the overall "Best in Show" in CNET's "Best of CES" awards. The innovative Eco TV (42PFL5603D) is a high-definition LCD television that delivers superb picture quality while minimizing power consumption. To qualify for "Best in Show", the Eco TV won the television category for the "Best of CES" awards. The Eco TV is designed with several power saving features such as a proprietary dimming technology that is designed to lower the LCD panel backlight to reduce power consumption without compromising the picture quality. A built-in light sensor automatically measures the viewing room's ambient lighting and adjusts the television's backlight for power efficiency while incorporating lead-free components and flame retardant materials, which are safe to the environment. Furthermore, the packaging box and user manuals are all made of recycled materials. The Eco TV will be available in March and will carry a suggested retail price of $1,399. http://www.cnet.com/ces

DisplaySearch reports LCD TVs surpass CRTs

by Ross Young and Paul Gagnon

Ross Young is the founder and chief research officer of DisplaySearch. Prior to founding DisplaySearch in 1996, he served in senior marketing positions at OWL Displays, Brooks Automation, Fusion Semiconductor and GCA in the driver IC, flat panel automation, etch and strip and lithography markets respectively. Ross attended the University of California at San Diego (UCSD), Australia's University of New South Wales, UCSD's Graduate School of International Relations and Pacific Studies and Japan's Tohoku University.

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.

We all knew it would happen, but it happened a little earlier than most experts expected. LCD TVs overtook CRT TVs worldwide in Q4'07 as shown in *Figure 1* and reported in our most recent *Quarterly Global TV Shipment and Forecast Report.* LCD TVs rose 41% Q/Q and 56% Y/Y to 28.5M units in Q4'07 earning a 47% share of the global TV market, up from 40% in Q3'07. Conversely, CRT TVs were up 4% Q/Q on seasonal strength but dropped 21% Y/Y to 28.0M units and a 46% share, down from 54% in Q3'07.

Q1'06 – Q4'07 LCD vs. CRT TV unit share
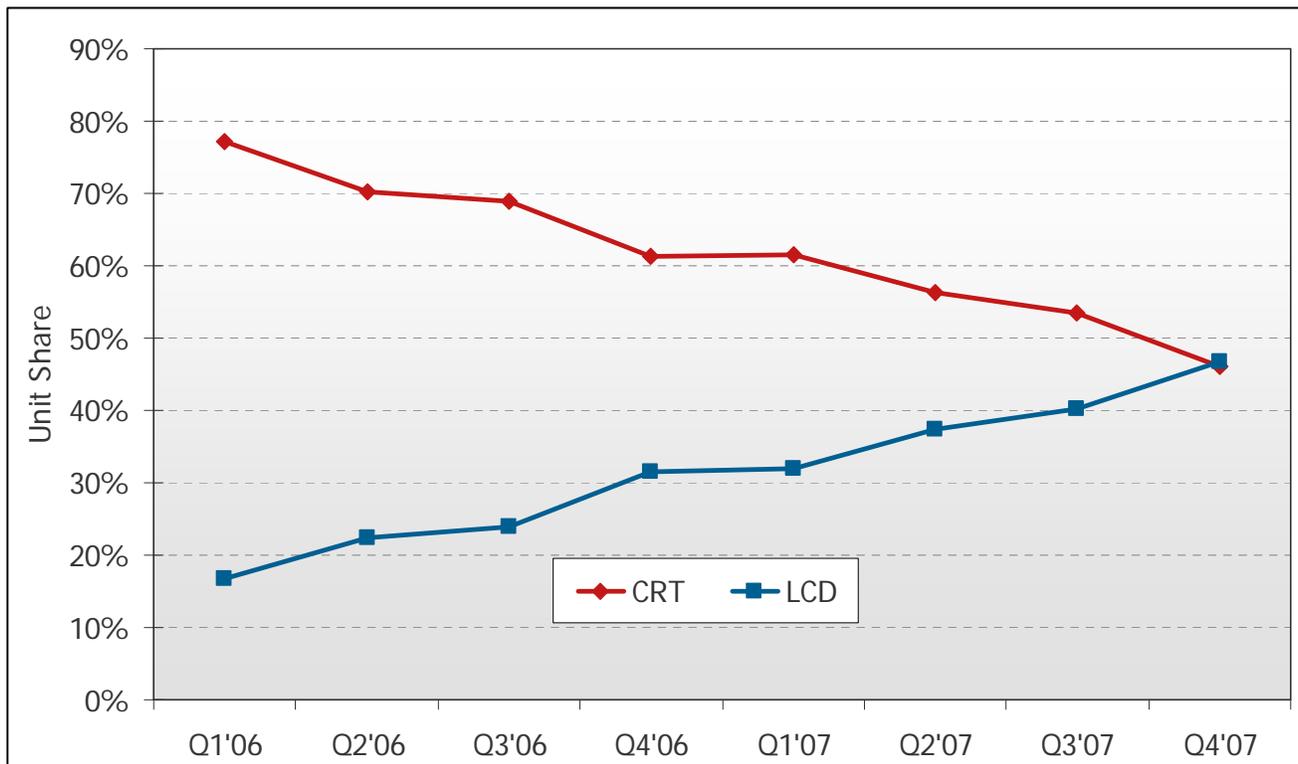
There are several reasons for the faster than expected crossover:

- **Natural replacement for CRT —** LCDs are the only technology that covers the markets currently occupied by the CRT, ranging from 10 to 36 inches making them a natural replacement for the CRT at these sizes as consumers look to upgrade to flat panel. In addition, with the CPT supply chain now hurting as the market declines, it is becoming increasingly risky for brands to rely on CRT TVs for a large percentage of their volume which is accelerating the shift to LCDs. In Q4'07, LCDs were the #1 technology at a number of sizes that were previously dominated by CRTs including 15-19 inches, 22-24 inches, 30-34 inches and 35-39 inches.

- **Adoption of LCD monitor panels** - With LCD TV panel supply tight and focused on large sizes, LCD TV brands turned to LCD monitor panels for their small size TV panel needs increasing their total available market. This is a win-win for both panel suppliers and TV brands. Panel suppliers earn higher margins selling monitor panels than similarly sized TV panels and in most cases than even larger sized TV panels. In addition, LCD monitor demand growth is slowing so they welcomed this opportunity. TV brands also benefit as a result of more plentiful panel supply. There were 184M LCD monitor panels produced in 2007 with 200M expected to be shipped in 2008 and DisplaySearch is now tracking the number of LCD monitor panels used in LCD TVs on a monthly and quarterly basis.

- **Strong demand for flat across the world –** LCD TV adoption accelerated across the world despite high LCD TV prices with the premium at similar sizes well over 100% and not narrowing much in the 2H'07 due to LCD supply constraints. Nonetheless, LCD TVs gained share in each of the eight regions we track due to their desirable form factor, picture quality, digital/HD/1080p capability, lower energy consumption, etc. LCD penetration was highest in developed regions, reaching 86% in Japan, 84% in Western Europe and 78% in North America. However, the strongest unit growth was in developing regions, such as Latin America, Asia Pacific, and Middle East & Africa, where penetration is low and the opportunity is substantial. These three regions combined for 106% Y/Y growth with penetration rising from 8% to 15%.

- **1080p –** Only LCDs offer 1080p resolution in the 20 and 30-inch space and dominate the 1080p TV market in the rapidly growing 40-47-inch space. Why is this important? Consumers have shown that they are willing to pay a significant premium for 1080p TVs as consumers equate them with the best TV quality on the market and being "future proof" due to their compatibility with next gen DVD and gaming content. This premium improves the margins for all layers of the supply chain, which funds aggressive advertising campaigns and additional production capacity. 1080p LCD TVs were up 286% Y/Y in Q4'07 and reached 17% of the Q4'07 LCD TV market, up from 7% last year. In addition, 1080p LCDs are now the #1 product in the 40"-47" TV market with a 40% share, up from just 18% last year.

- **Strong gains at larger sizes -** Due to their form factor advantage, larger number of brands and 1080p capabilities, LCD TVs are taking share from competing technologies at larger sizes as well. LCDs overtook plasma at 40-44 inch in Q4'06 and held a 70% to 30% advantage in Q4'07. LCDs dominate at 45-49 inch and they continue to take share at 50 inch+ with a 29% share, up from 7%, and should see further share gains as the number of 8G fab announcements increase.

More details on Q4'07 and 2007 LCD TV results

2007 LCD TV shipments reached 79.3M units, a 73% increase from 2006. On a revenue basis, LCD TVs grew 34% Y/Y and 31% Q/Q to $22.8B — accumulating almost $68B total in 2007, a 40% boost Y/Y.

- The 40-inch+ share of the LCD market expanded from 17% to 25% Y/Y on a unit basis and 33% to 44% on a revenue basis with the average size exceeding 32" for the first time.

- 1080p LCD TV shipments rose 71% Q/Q and 286% Y/Y to climb to 17% of all LCD TV shipments and 57% of 40-inch+ units.

- Western Europe regained the share lead as the top region for LCD TV shipments, rising from 28% to 32%, overtaking North America which fell from 33% to 31%. China remained the #3 region.

- On a brand share basis, Sony overtook Samsung as #1 in revenue at 19.5%, leading for the first time since Q1'07, but Samsung remained #1 on a unit basis. Sony had the strongest Q/Q revenue growth of the top five and outpaced total LCD Q/Q revenue growth 2:1. Sony also led in North America and Latin America on a revenue basis, while Samsung was the top brand in Eastern and Western Europe as well as Asia Pacific and Middle East & Africa. Sharp led in Japan while Hisense was #1 in China.

Table 1: LCD TV Brand Revenue Share and Growth

Rank	Brand	Q3'07 Share	Q4'07 Share	Q/Q Growth	Y/Y Growth
1	Sony	15.9%	19.5%	61%	41%
2	Samsung	18.7%	19.3%	35%	67%
3	Philips	9.7%	10.1%	37%	23%
4	Sharp	12.5%	10.1%	6%	21%
5	LGE	7.8%	7.7%	30%	54%
	Other	35.4%	33.3%	24%	20%
	Total	**100.0%**	**100.0%**	**31%**	**34%**

Beginning with the Q1'08 report, DisplaySearch's methodology has been improved by providing volume weighted average brand-level ASPs in North America back to Q1'06, which has increased revenue and revenue-based market share accuracy.

DisplaySearch's TV market intelligence including panel and TV shipments, TV shipments by region by brand by size for nearly 60 brands, rolling 16-quarter forecasts, TV cost/price forecasts and design wins can be found in its *Quarterly Global TV Shipment and Forecast Report*.

Retail price survey of LCD TVs in Q4'07

by WitsView

WitsView is a neutral market research firm dedicated to the TFT-LCD industry, providing a full coverage of information resources and analytical research to over 1,800 companies worldwide. WitsView's service consists of all-round quantitative research, bottom-up industry analysis and insightful market viewpoints that enable clients to make prompt and convinced decision. http://www.witsview.com

According to WitsView's survey, the global average retail price dropped more moderately in 4Q07. In the 20~47-inch size group, a 2.9%~4.0% Q/Q decline was seen, while in 3Q07, it reached -4.9%~-9.5%. Not only was a slower rate of decline seen in the different display sizes in 4Q07, a few had even experienced an increase - a development that was previously unseen before. From a Y/Y growth perspective, most of the sizes still saw a 15~20% decline in 4Q07. A year earlier, a 32-inch model was priced at more than USD 1,000. Currently, it is available for only US$813. For the 42-inch, it retailed for US$2,000 in 4Q06; in 4Q07 it sold for US$1,423.

20-inch category: Prices for the 20-inch LCD TV stood at US$472 in 4Q07. Among the different size groups, the most moderate price fluctuations was seen in the 20-inch, dropping annually by an average of 10%. Although the 20-inch LCD TV has replaced the 20-inch CRT TV in some markets, it has not been able to effectively meet the new market demand for widescreen and higher resolution displays (Resolution of 20-inch LCD TV: 640x480 or 800x600). Many manufacturers have responded by employing mainstream 19-inchW and 22-inchW panels for LCD TV production. As these products have gained popularity, the pressure on the 20-inch LCD TV has grown.

The 26-inch LCD TV was retailed at US$660, down US$19 Q/Q. On a Y/Y basis, it slipped 19.8%, the second largest price drop after the 47-inch. The market position of the 26-inch has often been awkward, as it may be a bit too small for the living room, but too big for the bedroom. Currently, the 26-inch TV panel is mostly supplied by Taiwan panel makers.

Worldwide LCD TV average street price Q1'06-Q4'07

	Q4-05	Q1-06	Q2	Q3	Q4	Q1-07	Q2	Q3	Q4
20	596	570	559	535	526	519	513	477	472
26	1,231	1,131	1,050	954	883	842	750	679	660
32	1,588	1,438	1,338	1,179	1,071	992	898	818	813
37	2,258	2,057	1,864	1,620	1,486	1,333	1,216	1,139	1,127
40	3,174	2,485	2,249	1,972	1,853	1,723	1,572	1,443	1,485
42	3,583	3,281	2,704	2,190	2,036	1,675	1,549	1,453	1,423
46	4,820	4,607	4,146	3,489	3,115	2,836	2,526	2,402	2,390
47	4,060	3,779	3,709	3,068	2,830	2,562	2,260	2,118	2,033

30-inch category: During the 2006 Black Friday sales, the 32-inch could be bought for an astonishing US$499. However, in 2007, most of the 32-inch TV sales promotions reached only US$449 (a US$399 Element brand TV was spotted at Circuit City). Evidently, the drop was much less enticing when compared to last year; an indication that prices of the 32-inch could become more stable in 2008. In 4Q07, the retail price of the 32-inch reached US$813, down sequentially by only US$5. In some market, 32-inch prices in 4Q07 were even higher than in 3Q07. For example, in the Japan market, the 32-inch increased from US$923 in 3Q07 to US$973 in 4Q07, which mainly stemmed from a prices increase in the budget 32-inch models and launch of several high-end TVs (Example Sharp's FHD model launches).

The average price of the 37-inch reached US$1,127 in 4Q07, down 17.4% Y/Y, roughly the same as the 17.9% ratio for the 32-inch. Thus, the 37-inch and 32-inch price difference remained at 38%. By contrast, the gap between the 37-inch and 42-inch declined from 37% in 4Q06 to 26% in 4Q07. Thus, in order to maintain its market competitiveness, prices will likely be cut further for the 37-inch.

40-inch category: The average price of the 40-inch reached US$1,485 in 4Q07, which was up from US$1,443 in 3Q07. The price increase was mainly due to the many new FHD product launches. For the entire year, the 40-inch slipped by only 14.8%. Excluding the 20-inch, the 40-inch was another size that more notably bucked the trend. Meanwhile, the 42-inch retailed at US$1,423 in 4Q07, down 2.1% Q/Q. In 1Q08, it may slip past the US$1,400 level earlier than the USD 40-inch.

Beginning in 2007, the price of the 40-inch and 42-inch started to grow closer. At the moment, the gap between the two stands at US$60, where the 40-inch is instead more expensive than the 42-inch. As the 42-inch TV panel is produced by the G7.5 line, mass production of the size was slower than the G7-produced 40-inch. Thus, during the initial stages, the 42-inch owned a higher cost structure. Before 2007, the 42-inch TV played catch-up with its cheaper 40-inch counterpart.

In major global markets, the 40 vs. 42-inch battle consists of two camps. The 40-inch group is backed by Samsung and Sony, while supporters of the 42-inch consist of a much larger base, including both Tier 1 and Tier 2 players. The only exceptions in the market status are found in the Japan and China markets.

In Japan, the 40-inch TV is only offered by Sony and Mitsubishi, where the latter merely owns a small shipment base. Samsung, who is another important 40-inch supplier, does not offer TV products in Japan. Meanwhile, in the 42-inch segment, key brand vendors include Sharp, Toshiba and JVC. Although in 2007 Toshiba unveiled its high-end 40/46-inch RF series and Z3500 series in replacing its older 42/47-inch models for the 40-inch lineup, the recent strategic alliance between Toshiba and Sharp should likely result in Toshiba focusing on 42/46-inch TV sets again.

Intense competition in the 40/42-inch is also seen in the China market, as both sizes have a strong support base from local brands such as ChangHong, TCL, Haier Hisense, SkyWorth, Xoceco and Konka.

The average price for the 46-inch reached US$2,390 in 4Q07, a slight Q/Q drop of 0.5%. The 15.7% Y/Y decline was roughly the same as the 14.8% drop in the 40-inch. Compared to the 40-inch, the 46-inch is an efficient cut size in the G7 line. Price-wise, the latter has a 61% price premium over the former, which is not too different from the 68% ratio for 4Q06. However, in 4Q05, the difference between the 40/46-inch was only 52%. Thus, the 46-inch does not appear to be a size that TV makers seek to actively promote.

The average price of the 47-inch reached US$2,000 in 4Q07 – the largest drop among the different sizes. As a matter of fact, for the entire year, the sharpest price decline also belonged to the 47-inch. When compared to the US$2,830 price level in 4Q06, the 47-inch has already fallen by 21.1%. Currently, the 47-inch is US$357 cheaper than the 46-inch. By contrast, in 4Q06, the gap stood at US$285. The amount of 47-inch models is fewer, as the top three TV makers – Sony, Sharp and Samsung do not offer any 47-inch TV sets. In addition, most of the current 47-inch sets are FHD, creating a more difficult product segmentation if based only on the panel resolution.

Annual price changes: In terms of the Y/Y price declines, the drops in 2007 have been smaller compared to 2006. Thus, no direct relationship can be drawn between the price and particular display size.
By observing 2006, excluding the 20-inch, all the other sizes experienced a decline exceeding 28%, where the 40/42-inch was the most notable. Sizes that were either larger or smaller underwent a smaller decline, portraying an upside down V-shaped price trend in regards to the 40/42-inch. Amid the continued ramp-up of the 40/42-inch panels, along with the sharp price cuts by TV makers, it has also allowed the 40/42-inch to be better accepted by consumers.

For 2007, the annual price decline was evidently smaller than in 2006. This can be attributed to the more stable panel prices in 2007, and more attractive retail prices of mainstream TV sizes. However, sharp price cuts were not conducted on the 40/42-inch in closing the gap with the 32/37-inch and stimulating the consumer demand. Separately, for the living room TV, the 26-inch and 47-inch, which fall respectively at one end of the spectrum, experienced more notable price drops. In the 26-inch category, the larger 32-inch has already fallen to a level, where mid to low incomes households can more easily afford such TV sets (prices have fell below US$800 in Dec07). Thus, in order to survive in the market, the 26-inch needs to widen its price gap with the 32-inch. As for the 47-inch, with the overall brand support weaker than the 46-inch, it faces much larger price pressures.

2006 Street Price Falling Percentage

2007 Street Price Falling Percentage
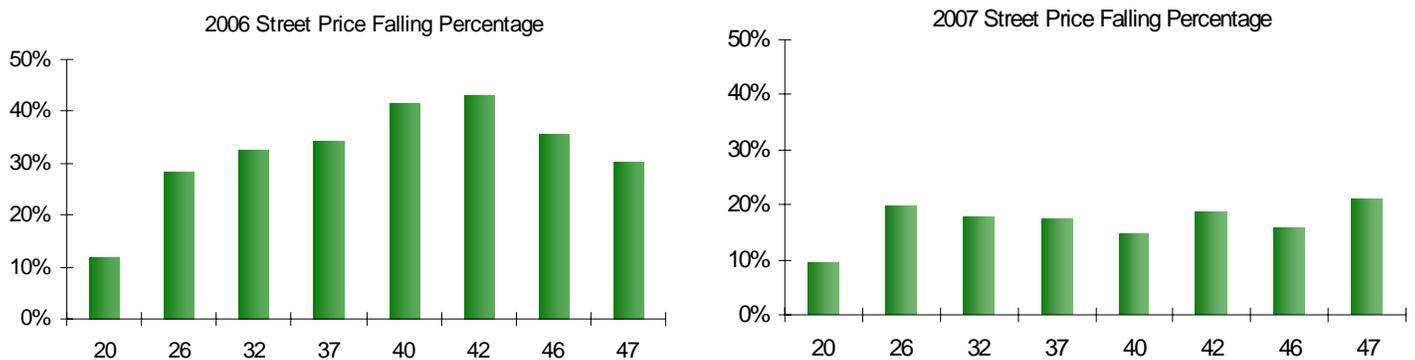
Sustaining Members:
Thank you for your support!

"A Great TV in Every Room"

Interview with Terry Yeo from Fusion Optix

Dr. Terry Yeo is president & CEO of Fusion Optix, a company he founded in 2003 while living in Cambridge, UK, (http://www.fusionoptix.com**). His early career, and the inspiration for Fusion Optix, was spent in the displays, aerospace and optical networking industries. In working for Nortel Networks, EADS Astrium, and Nashua Corporation he performed in a number of senior management, corporate venturing, sales, marketing and technical roles. In these roles Dr. Yeo contributed to the invention, development and commercialization of a number of patented optical technologies in the areas of liquid crystal displays, microdisplay projection displays, and precision optical components for use in consumer, business, aerospace and military markets. Dr. Yeo also has insider experience of the venture capital industry, having worked for Amadeus Capital Partners in the UK. He has been a consultant to several technology companies and start-ups. Dr. Yeo holds a Ph.D. in Physics and a First Class Honors Degree in Electronic Engineering and Physics from Loughborough University. He completed his formal business education by gaining his MBA from Cambridge University's Judge Business School. For further information, contact:** terry.yeo@fusionoptix.com

Please give us some background information about Fusion Optix. Fusion Optix is a four-year old company based in Cambridge, Massachusetts. We are privately held with investment from Goldman Sachs (London), Prudence Capital (Taiwan), and a group of East Coast angel investors. We own nearly 30 patents in the areas of materials science, optical components and optical systems. Our mission statement is to become a leading provider of optical films and components, such as light guides and diffuser plates, and LED backlighting solutions. We have recently transitioned from R&D phase to become commercial and we are shipping product, and have programs in place with several major industry players, and are growing rapidly. At the core of our unique value proposition is a disruptive materials technology. Most of our manufacturing capabilities are in-house, and we partner with reputable companies that have established manufacturing processes and assets when necessary, for instance in order to better serve the large area, large volume requirements of the global LCD industry. In addition we have established in-house rapid prototyping and assembly capabilities so we can innovate more freely and develop new products at pace.

Is there any particular meaning behind the company name? Actually, yes there is. The name was chosen to reflect that we are experts on optics, clearly, and we are focused on the combination of optics and materials science to create advanced optical components. Mingling these components leads to advanced system design, thus a fusion of technologies, ideas, scientific principles, design, and most importantly, optics is created.

Can you start off by giving us a short tutorial about LCD backlight design and light diffusion technologies that have traditionally been used in LCDs? Most LCDs are non-reflective and require a backlight module in order to make the image visible. These backlights fall broadly into two different design camps namely edge-lit and direct-lit.

Fusion Optix product strategy is to leverage its disruptive materials technology into a portfolio of optical film and sheet products. In addition the company is addressing LED packaging technology where it sees an opportunity to increase overall system performance.

With respect to edge-lit displays, the optical system in an LCD backlight consists of a light guide that extracts light from the light source and carries it across the active display area maintaining as much uniformity as possible. Then there is a set of optical films to diffuse the light source without losing significant light and a prism film or two to collimate the light and maximize head-on brightness for the viewer. In high-end LCDs, a polarization recycling film is used to boost brightness, but these are costly films. In direct-lit systems, the light guide is replaced by a diffuser plate to help smooth out the light source and the rest of the optical system is similar to the edge-lit design. Typically, the light guide is clear acrylic or polycarbonate with a scribed or screen-printed pattern on one side to extract light. The diffusers are clear PET films with beaded coatings that create a diffusion effect. Prism films are clear PET films with a modified acrylic prism structure to collimate light using the principles of reflection and refraction.

Now, please give us an overview of the technologies that you are bringing to the market. Our ambition is that Fusion Optix's disruptive materials technology and new system designs will fundamentally change the way people think of LCD backlighting. At the heart of our unique technology platform is series of optical films based on volumetric diffusion — a totally new and unique film technology. The diffusion material is in the bulk of the film, not on the surface, which means a one-step manufacturing process and no expensive beads or extra tooling is required. Through the manufacturing process, we control the size, shape, and distribution of the diffusion particles, and can achieve a virtually limitless range of angles. We also control the surface of the film, and offer matte or glossy finishes depending on the application. Multifunctional films are also possible where prism or other light redirecting structures are coated or embossed onto the film.

Fusion Optix Product Strategy
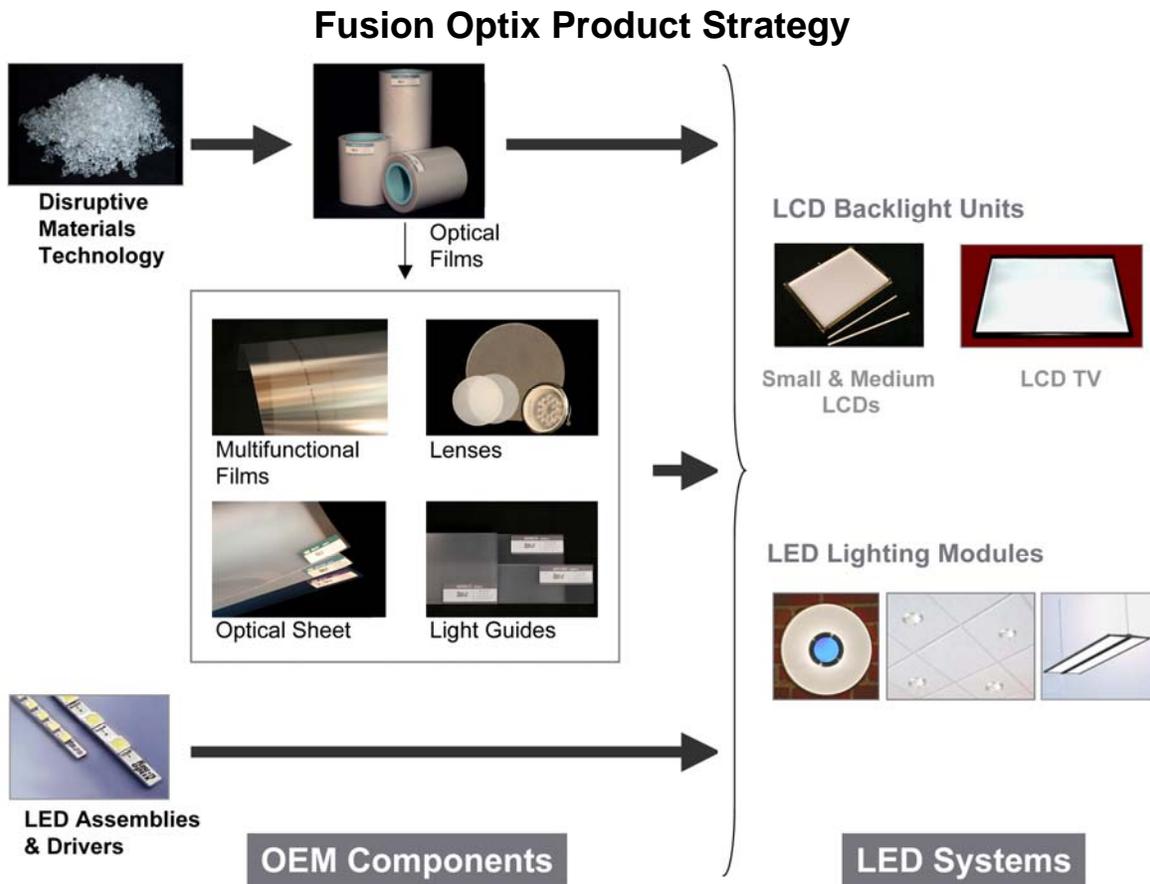
Because we can achieve both symmetric and asymmetric diffusion profiles, we have more freedom within the optical system. For example, we find that using a high angle asymmetric film as a bottom diffuser eliminates the need for the diffuser plate in an LCD TV, and it is more efficient than the current system design. Additionally, asymmetric diffusers are very effective at homogenizing point light sources, making them ideal for LED backlighting. Fusion Optix has been focusing on LED backlight design that leverages our unique diffusers.

Also, we've developed a series of light guides for LCD backlighting that allows us to edge-light small-medium area displays. The next step is to incorporate the volumetric diffusion technology into these light guides to provide extra diffusion and possibly eliminate the number of components in these backlights. We were recently awarded a US patent to cover this approach at both a light guide and backlight and panel system level.

Most light management solutions to date have used PET film substrates. Tell us about your preferred materials. We actually stick with PET as the base material for many of our films, but we also work with PETg, PC, and a variety of lesser-known high performance polymers. Materials science is a large part of what we do and much of our early development work was centered on optimizing the materials choice. Efficiency, shrinkage, robustness — these, and many others, are all key factors that contribute to materials choice, and we pay close attention to these issues. One of our major partners is NOVA Chemical, a leading polymer material company in North America. Together, we have developed several unique and proprietary materials systems to helps maximize our technology's potential.

By adding prism and microlens structures to your diffusion films, you can effectively deliver collimation and diffusion in a single film. Tell us why this of benefit. Many traditional diffusers have some collimation effect as a result of the surface structures, but this is almost a by-product of the necessary beaded coating. By adding a prism (or microlens) structure to the surface, we achieve BEF-like performance as well as diffusion in the same film. Depending on the light source and system configuration, this can reduce the number of films in the film stack. The diffuse base film is adjustable, meaning we take the asymmetric films mentioned above and turn them into brightness-uniformity enhancement films. Cost is the driving factor for LCD backlight design, and we are aware of the pricing struggle taking place in the LCD industry. Eliminating a component or two without compromising performance is a significant benefit given the current supply chain climate.

When looking at a TV with your multi-functional film, can someone actually see a difference from the predecessor solution? It comes down to optical system configuration. Yes — you will see higher brightness and even improved viewing angles, depending on the rest of the backlight system. In a CCFL-lit TV, as most on the market are, the best way to approach the system is to eliminate the diffuser plate and diffusion films and instead insert our asymmetric bottom diffuser and multifunctional film in order to achieve maximum efficiency, which in turn means higher brightness levels. In conjunction with traditional optics, the full benefit of our films is less apparent. This is why we have taken a systems approach in the last year — we realize that the fusion of optics is what creates a truly high performing system.

Fusion Optix components and backlight designs result in brighter displays with wider viewing angles. Fusion Optix recently showcased a sub-1 cm thick 24-inch monitor with its enabling LED backlight design at CES 2008 in Las Vegas.

Why do we need your solutions – why not just make brighter and brighter lamps? With brighter and brighter lamps come more and more lumens to control. The problem with new HB LED backlighting approaches is no longer the efficiency of the light source so much as the control of the light. The backlight designers and LCD panel companies are finding it difficult to solve the headlamp and hotspot issues associated with LED backlighting

because traditional diffusers are not effective. They were designed for Lambertian light sources in a specific configuration. Diffusing high-bright point light sources requires a new kind of diffuser that can handle the lumens and directionality. Our solutions aren't just about increasing brightness — we are in the business of controlling light, whether it's collimating, diffusing, redirecting, etc.

You seem to be treading into the waters that have long been dominated by 3M. What is it that you offer which is different from 3M's Brightness Enhancement Film solutions? This is a common misconception in the market: Fusion Optix is not trying to compete with 3M. 3M is not trying to diffuse — true, we are collimating, but we add prisms to our diffusers to enhance overall system performance. The fundamental difference, the diffusion layer, is so unique that it's hard to pit us against a company whose technology is based on clear PET. We prefer to consider ourselves as opening up the design space and creating more options for the display systems engineer.

Are your films appropriate for all display sizes, (mobile phone sizes up to the largest LCD TV)? Or do you see LCD TVs as the primary area on which to focus your energies? Yes, one of the other film properties we control is gauge: we've made films as thin as 20 µm and as thick as 1000 µm with little variance. In terms of performance, our films are beneficial in LCDs of all sizes.

You are focused on LED backlighting systems, which are currently still a relatively small piece of the LCD TV market. Is your technology not well-suited for CCFL solutions, or did you decide to focus on LED backlighting solutions for a specific reason? All of our products work with CCFL, it is just that we have chosen to focus on a systems level mainly on LED backlighting solutions. We have different types of diffusers and there is a home for each one in flat panel displays. Whether Lambertian or collimated, the light source determines the diffusion strength and distribution, then we go from there to find the best solution. All of our products were developed in the CCFL atmosphere, but when it comes to enabling the new wave, we are more than compatible with LEDs. Our technology is so complementary, and LED backlighting solutions are in such high demand that it seems silly not to focus on this emerging trend. We can actually help LCD TV get there faster.
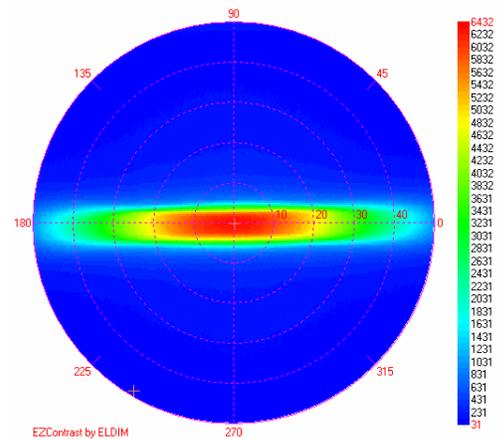
Example of optical output from Fusion Optix collimated backlight

RGB backlighting could enable LCD makers to eliminate the color filter. Give us your thoughts on this technology and how your films might help. Whenever a backlight systems designer is trying to achieve a different result to the established design Fusion Optix believes it can play a role in enabling the new design objectives. New RGB backlighting designs that are specifically attempting to eliminate color filters demand higher levels of precision in diffusion and light control. In simple terms, existing films are rather crude and these new designs need the optical film to put light exactly where it is needed in order to reduce unwanted cross talk and loss of color fidelity.

Since cost and performance are almost always trade-offs to the LCD maker, do you feel they are primarily focused on reducing cost (maintaining current performance), or is the interest more in terms of improving performance, even if there are cost concerns? As I mentioned earlier, cost reduction is clearly a primary concern for the high volume consumer electronics focused segments of our industry. We receive a lot of interest and demand for cheaper versions of existing products but we believe there is still plenty of room for innovation. For instance, our solution to cost reduction is to offer components that can potentially reduce the number of components necessary to reach acceptable performance levels. Our aim is to reduce lamp and LED count and to reduce the number of film or sheet components used. Furthermore, our solutions enable the widespread adoption of LEDs, the new rage in backlighting for obvious reasons. I think that cost is still the driving factor with respect to CCFL-based LCDs, and suppliers are getting squeezed left and right because there has been no real system innovation. Whereas, introducing a new light source, that is innovative, and a long time coming for larger size LCDs, the LED factor is alerting consumers to the fact that their electronics could be helping to save the planet;

Apple and others have aligned their electronics with the green movement, putting a certain amount of pressure on the LCD panel guys to deliver not just to Apple, but to Apple's loyal customer base. In this area, we find that performance outweighs cost as the OEMs struggle to make green displays that actually look good.

Considering increasing concerns about the environment, are there any things you are doing that help facilitate "green" electronics?　Yes, the big push, green electronics. Being a young company, we are passionately pursuing greener products. At first, LEDs were bright and robust and certain specialty display companies needed them for practical reasons. Now, with the push from companies like Apple, we see that green consumer electronics are the next big thing and our solutions help fuel the fire. By enabling the adoption of a greener light source, we are participating in this movement. By designing highly efficient optical systems, we are saving energy. Finally, by reducing the number of components in the backlight, we are manufacturing less plastic and reducing waste.

There are huge efforts underway to create flexible displays, but these developments are almost entirely based on emissive or reflective display technologies. Can you foresee a time when flexible transmissive displays might be able to utilize some sort of flexible backlighting solution?　We certainly think this a possibility and we have been able to demonstrate a flexible backlight

Cross section of an LCD panel incorporating Fusion Optix film.

approach based upon our core technology. We would be interested in hearing from developers of flexible displays to see if this is worth taking any further. Technically there are some interesting possibilities; the answer to the question though, is probably more in the business model of the flexible display company.

The ongoing trend from 1280x720 to 1366x768 to 1920x1080 – and now to even higher resolutions – is certain to increase demands associated with improved light management. Is your technology ambivalent about pixel pitch, or do you have to do special things as resolution increases?　Effectively we are ambivalent about pixel pitch. Our technology is based upon core optics technology that is of the order of 5 μm in physical size and is entirely random. We have specifically developed our approach so that as displays become higher resolution we can continue to offer our solutions.

Similarly, recent interest in 3D displays will almost certainly require brighter backlighting solutions. Is there anything special you are doing to develop films for the 3D LCDs?　There are a number of different approaches to achieve 3D performance; the backlight can play a role in quite a few. Since most require some additional filter or lens system to be placed in front of the panel, there is a need for brighter backlights. In some cases control of the backlight optical output is also important. For instance, we have recently seen interest in a version of our LED backlights that has an unusually narrow distribution in one axis. We developed this backlight to help eliminate the privacy filters typically used in ATMs, but it appears to have found a use with 3D display developers since it helps ensure minimal cross talk between the two channels that typically combine with colored or polarized glasses to create the 3D effect.

Do you regard your primary customers as the backlight makers or the LCD manufacturers?　Interestingly enough, we're seeing a shift in our customer base directly related to LED backlighting. For a long time, due to the inflexible LCD supply chain, we focused on backlight makers as our primary customer base for obvious reasons. But for an industry that moves so fast, we are finding resistance to innovation. What I mean by that is simply that backlight makers are reluctant to do anything other than build what the LCD manufacturers tell them to build with little or no design freedom. So when Fusion Optix shows up with truly innovative designs, it's a hard sell. Many

times, it's easier for the LCD manufacturers to understand the implication of our systems and quite frankly, this puts us in competition with the backlight makers. But we don't and most likely won't build backlights, so competition is not the way to look at the situation. I think we prefer a situation in which the LCD manufacturer specifies our design and associated components to the backlight maker. We then supply the components to the backlight maker. That way, we all win. We sell our components, the backlight maker gets their traditional assembly business, and the LCD manufacturer gets a higher performing or lower cost product that helps drive their sales.

Do your customers want to buy films from you, or do they seem more interested in licensing the technology from you? In most cases, people are quite happy to leave the film manufacturing up to us. Virtually all our enquiries now are for us to supply films, and the volumes are going up. In the past though licensing certainly came to the forefront of many customer discussions. We have also been approached by several "players" to license our patent portfolio. In some cases we have also had to fend off competitive situations that started as enquiries about licensing, despite our strong patent position. To be honest it feels like ours were a fairly typical set of experiences for a young technology company trying to establish itself; mostly those are behind us now.

Tell us about your manufacturing operations. We have an in-house film line that can product films up to 12 inch wide. We are in complete control of this asset and use it both for production and rapid prototyping purposes. Large volume film manufacturing is very capital intensive, so we have gone down the path of partnering with reputable, well-established film manufacturers, some involved in this industry and some not. For medium volume applications, we work with smaller roll manufacturers in North America. In both situations, we have transferred proprietary technology and retain ownership and control of the materials, process and product related IP, and we have a dedicated team in-house that leads these efforts.

The Fusion Optix solution helps address issues related to the thickness of LCD TVs

Please describe what you think Fusion Optix will look like three years from now. Our mission statement is to become recognized as the leaders in innovation centered on LCD backlighting technology. It's not about revenue (okay, it's always about revenue), but more importantly it's about helping consumers gain access to the highest performing, best looking displays possible. We want to partner with our customers to eliminate innovation barriers, broaden the design space, and get the latest and greatest into people's homes. We also want to be at the forefront of the adoption of LED technology and greener products. Outside of displays we are involved in several lighting programs with some major players in that market. Although the adoption of LEDs in lighting is lagging displays somewhat, we see it as a very exciting opportunity.

Finally, tell us one of your favorite customer success stories. It's always nice when a customer reveals that Fusion Optix is a "must have" or when in the middle of a meeting they remark, "Wow this is really cool stuff!" I don't think I will ever get tired of that, and it makes a lot of the hard work worthwhile. A specific story that comes to mind happened quite recently. We had been working on an internal program to develop a completely new LED backlight design which was fairly blue sky. We weren't sure exactly how much demand the product would generate but we had a very good hunch that it would be interesting to a number of companies and the performance was unique enough to persuade us to push it forward. The product required a completely new approach to optical film and light guide design and we were keen to try this out and measure the performance in a fully assembled system. About a week or so after we pulled together a technology demonstrator and gathered the initial test results we were in a meeting with a customer. They were asking us to provide some films and the discussion got fairly detailed to a point where after an hour or so we had developed a baseline system level specification table. At this point we pulled out the test results from the week before complete with pretty pictures to show a near perfect match as if to reunite twins separated at birth. We bagged a PO right there and then. It was a great feeling!

Interview with Bharath Rajagopalan from Dolby

Bharath Rajagopalan is a veteran of the electronics industry having served in technical, managerial, and executive roles in research and development, manufacturing, technology and product development, quality and reliability assurance, operations, business development, product marketing, as well as in sales and marketing. He is currently at Dolby Laboratories, Inc. where he serves as the business line director responsible for the High Dynamic Range business with particular focus in the LCD TV segment utilizing Dolby's 2D dimming technology. Prior to joining Dolby, Bharath was at Hewlett-Packard where he was responsible for creating new businesses in its newly formed Digital TV solutions. This involved the successful creation of a commercial TV business (with focus on key industry vertical segments such as hospitality and digital signage). Prior to HP, Bharath was with Thomson-TCL Electronics, Texas Instruments, and IBM. He holds BS, MS, and Ph.D. degrees in Electrical Engineering as well as an MBA.

Dolby has long been recognized for its audio solutions; please tell us how Dolby came to be interested in the video side of LCD TVs. Interestingly, video has been at the root of Dolby. Prior to founding Dolby Laboratories, Dr. Ray Dolby was part of the team at AMPEX that developed and manufactured the VTR (video tape recorder). The very first product that Ray developed when he founded Dolby Laboratories was a video noise reduction (VNR) system but as the industry was transitioning from black and white broadcast to color broadcast, and since the VNR was developed with black and white broadcast, it was decided to apply these noise reduction techniques to audio. Fast forward a number of years, and with one of Dolby's core mission to improve the quality of entertainment we saw a very clear and compelling need for improvement in the quality of video. As such we develop and manufacture digital cinema servers, 3D digital cinema technology and other professional video technologies. In terms of the consumer displays, the venerable CRT has done a terrific job in terms of visual fidelity and so did not require a great deal of improvement. However, with the recent rapid penetration of flat panel displays, particularly LCD technology, image quality is a key issue that many in the industry recognize as requiring improvements. So, with our internal strengths in the video space, and with the recent acquisition of BrightSide Technologies, we are now well positioned to deliver compelling solutions for the dramatic improvement of the video quality of LCD displays.

With regard to Dolby's acquisition of BrightSide Technologies, is the BrightSide team still operating largely as a group within Dolby, or has the technology become a broader operation that is fully integrated into Dolby? The BrightSide team has been fully integrated within Dolby and is now Dolby Canada with operations in Vancouver, BC. The Dolby Canada team is a strong complement to activities and teams across Dolby and as such we have made a conscientious effort to integrate it into the broader operations of Dolby.

Please start off by providing us with a bit of a tutorial about dynamic range. It all starts with the human eye. The human visual system (physical and perceptual) is capable of adapting to lighting conditions that vary by nearly 10 orders of magnitude (instantaneous adaptation). Moreover, within a given scene the human can see over a range of five orders of magnitude (simultaneous adaptation). What this really means is that the eye can operate over a broad luminance range. However, most display devices can reproduce at most three orders of magnitude and with very coarse gray
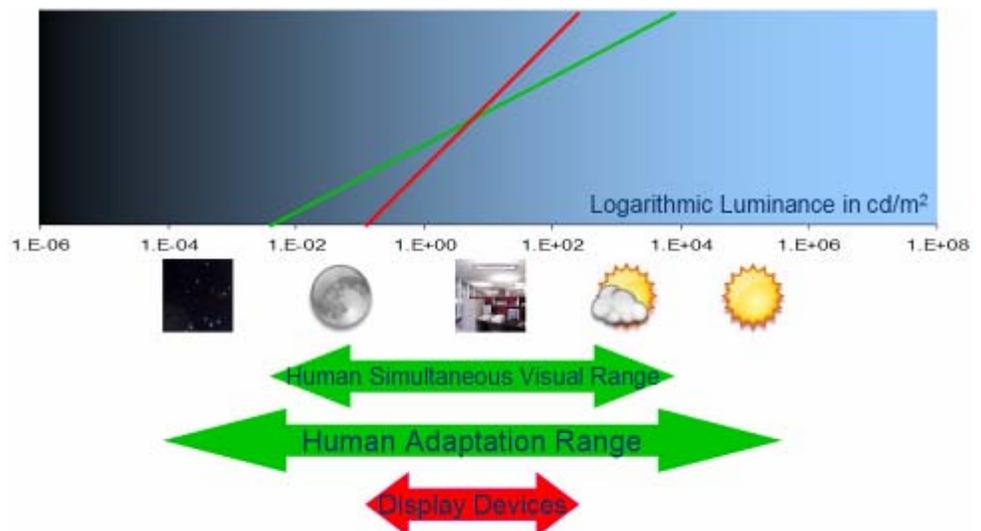
scale control, typically 8 bits per color. Dynamic range can be thought of as the ability to provide deliver fine luminance levels over a broad luminance range (broad gray scale with fine steps between levels). What we have today is a mismatch between human physical perception and display device performance. This is, of course, a very cursory treatment of a rich subject and there are some terrific books that treat this subject in depth. One notable book is entitled, "High Dynamic Range Imaging: Acquisition, Display and Image-Based Lighting", by Reinhard, Ward, Pattanaik and Debevec.

What is the difference between dynamic range and contrast ratio? As you know, contrast ratio has been at the center of some very active and lively dialogue. There are still various opinions on how to define it, how to measure it, how to interpret results etc. I won't attempt to tackle that aspect here. Clearly contrast ratio and dynamic range are highly interrelated. If you did not have dynamic range, both in terms of the width of the range as well as the granularity within the levels of the range, then the contrast ratio as perceived will be significantly impacted, irrespective of what the measurement *technique du jour* may suggest. On the other hand, and in general, with a high dynamic range one will also achieve high measured contrast ratio using whichever technique is preferred. But what is more subtle and harder to quantify simply in terms of a singular measurement value is the perceived dark scene performance. With a display device capable of delivering high dynamic range and using localized modulation, it is possible to deliver the right luminance level, to the right part of the image at the right time. In other words, to reflect the luminance in a given scene as it would be seen by the human eye. To simultaneously see details in both the darker portions of an image and brighter portions is the essence of dynamic range. Within this context, contrast (not contrast ratio) and dynamic range are, in some sense, synonymous.
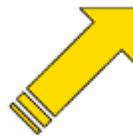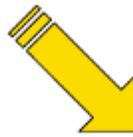
How do you go about specifying performance when it comes to dynamic range? Currently, the industry is still very much locked into standard measurement techniques and parameters and uses the language of contrast ratio. So, we will also adopt these measures, within the context of dynamic range, as it is easily understandable and recognizable to the various stakeholders in the industry. Within this context, a display with high dynamic range will show considerable improvements to the contrast ratio and luminance, and the degree to which these improvements will be made depends, of course, on the specifics of the implementation. On a longer term we are working, in conjunction with industry partners, on better ways of quantifying display performance measurements for dynamic range.

Tell us about the Dolby Contrast technology and how it serves to improve dynamic range. Dolby Contrast is the first announced product that is part of our HDR technology portfolio. It is essentially the implementation of localized modulation of luminance through a segmented approach – that is, has segments or clusters of LEDs in which each segment or cluster is independently controlled, as opposed to having each LED individually controlled. If you consider the points noted above in the explanation of dynamic range, you will see how when each segment or cluster is individually controlled to provide the luminance within that segment or cluster, that you can achieve improvements to the dynamic range of luminance in a given image, and consequently to the perceived (and measured) contrast ratio.

On a 40-inch screen, for example, how many LEDs are required to create an optimal solution with regard to your dynamic backlighting? This is the really interesting characteristic of the local modulation using LEDs. There is no optimal number of LEDS and the solution is one that can be personalized to suit the needs of a particular manufacturer. The key factors to consider are: desired brightness, target contrast ratio, type of LEDs, number of segments desired and, of course, cost. The cost target will, of course, also constrain the choices noted above. Hence, an optimization of the cost function will determine the answer to this question. Why this is interesting is that each manufacturer can differentiate their products, and even within a manufacturer they can differentiate between SKUs based, on target price points or retail positioning, etc.

Does the quantity of LEDs scale by screen size: (does a screen with twice the surface area require twice as many LEDs?) or by pixel pitch (does a 40-inch screen at 1920x1080 pixels require more LEDs than a 40-inch screen at 1280x720 pixels)? There is not a straightforward answer as the implementation depends on the entire system – that is, type of LEDs, configuration of LEDs, optical stack, panel, how the LEDs are being driven etc. In fact, the same LED BLU configuration can be used across a range – for example, it is possible to have a relatively constant LED BLU design between 40-50 inches but as you start to significantly increase screen size it will require changes, but not necessarily to the number of LEDs. It may be a smaller number of higher power LEDs, for example. There are other techniques as well such as the incorporation (or not) of say BEFs that come into play. Again, this is all very interesting as it provides great flexibility to the manufacturer and helps to mitigate rapid commoditization.

Is the ultimate way to control light intensity at the pixel level (or even the sub-pixel level) such that each tiny picture element can be individually modulated in terms of light intensity? This is what is done today after all. In LCD technologies, each LCD pixel will control the light that is incident upon its surface. The issue has been that the LCD pixels are unable to block the light completely and hence the excess "light bleed" causes the low measured and perceived contrast performance. Consequently, we have to approach the problem with localized modulation through, for example, LEDs in conjunction with the LCD pixels. On the other hand, if there is an LED element per pixel (assuming this is even possible) then we won't need the LCD panel then! It turns out that a relatively small number of LED elements are more than sufficient to deliver the dynamic range and contrast ratio performance that can be perceived by the human eye.

Do typical TV cameras capture video in ways that fully assure the dynamic range your display technology enables? How about personal video recorders and consumer-level digital cameras? Clearly, all cameras capture dynamic range – the question is, whether it is high dynamic range. All these capture devices vary greatly in their operations and the current ability and future capabilities to capture high dynamic range. In general, however, on the professional side it is possible today for cameras to capture higher dynamic range and this trend is only increasing. On the consumer side, many people capture high dynamic range through multiple exposure shots of an image then editing and recombining on a photo-editing software tool. The only issue is that there are not yet many (or any, for that matter) display devices that can allow them to see their HDR images. So clearly there is a need in the marketplace today in this regards. Finally, with consumer video recorders, we also anticipate that these devices will capture higher dynamic range as advances in this market segment continues to be made.

Several LCD makers have demonstrated RGB LED backlighting solutions, which might someday eliminate the need for a color filter. Does your technology work with RGB LEDs? To be clear, we have the basic IP and hold patents that are fundamental to the implementation of local-dimming based or dual modulation displays. The technique can work with white or RGB LEDs. In terms of elimination of the color filter, that is a much more

complex question and has to do with the optics of LEDs and the optics of the LCD stack and the color filter, etc. It is difficult to speculate at this time on how the industry will evolve in this regard, but the key point here is that our technology works with white or RGB LEDs.

3D LCD TVs are just now starting to appear on the market. Will your dynamic backlighting solutions similarly help enable better performance with 3D devices? Our current focus on the LCD TV market with the dynamic backlighting solutions are for standard displays.

How does your backlighting solution compare in cost to a conventional CCFL solution? As noted in several of the points above, the cost is a function of many factors: performance expectation (luminance, contrast ratio etc.), screen size, number of segments, type and number of LEDs, type and number of LED drivers, optical stack, etc. For sure the cost is higher than conventional CCFL, but of course with much higher performance. The main cost drivers are the cost per LED element. However, like Moore's Law for semiconductor ICs there is an analogous relationship for LEDs called Haitz's Law. With the rapid adoption of LEDs in other industries (such as general lighting, automotive lighting, CE devices like laptops, cell phones etc.) the industry is anticipating progressive cost declines and/or corresponding performance improvements.

Considering increasing concerns about the environment, tell us how your backlighting solutions play with demands for "green" electronics. This is a particularly exciting "side" benefit. At the equivalent brightness, systems that utilize LED BLU with localized dimming can achieve an average of 30% less power consumption than conventional constant backlighting when movie and other related programming is being enjoyed. In addition, LEDs are also mercury free and have a relatively long lifetime. So, from a green perspective, LEDs are quite favorable in this regard.

The original BrightSide demonstrators required a water cooled solution to accompany the backlight – is heat still an issue for you? That original unit, known as the DR-37 was constructed many years ago and utilized very inefficient LEDs. The goal at that time was also to have a very high brightness system to demonstrate fully the benefits of HDR. As a result the system at that time had to be liquid cooled. However, since that time, and even before Dolby acquired BrightSide, LEDs, drivers and the architecture have improved to the extent that the displays were fan cooled. So, I would say that heat in not an issue in the context of the question. However, thermal management is always important for any electronic product, and with LED based BLU with local dimming, the design and architecture must be such that thermal design needs to be considered as they always have been in TV products.
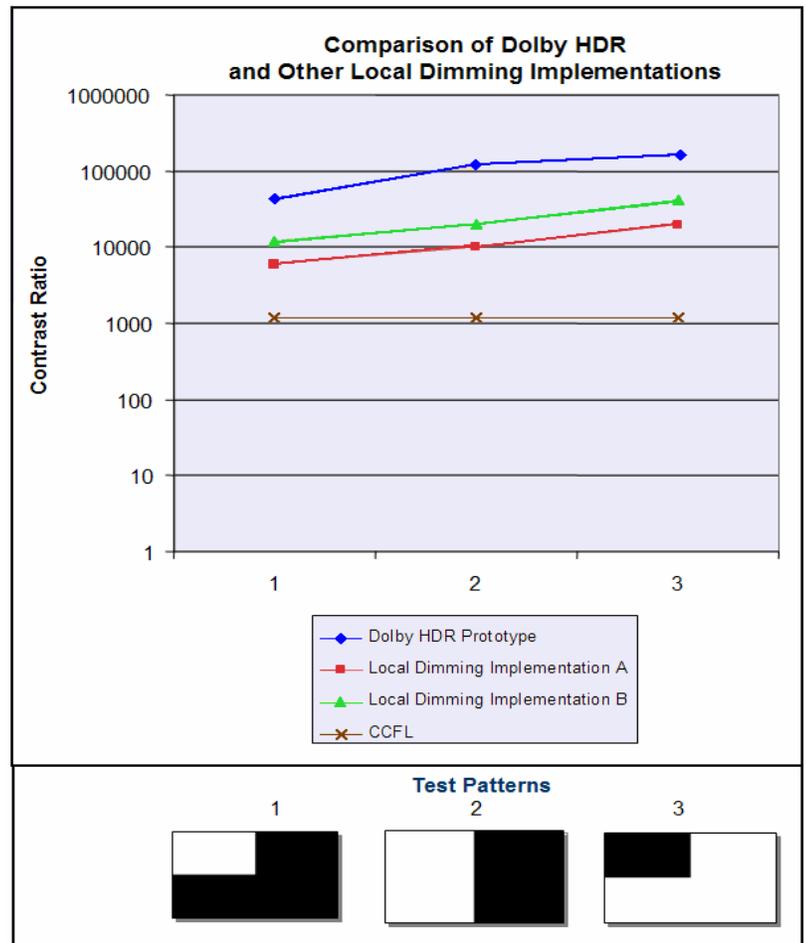
Will you be selling LCD TVs with dynamic backlighting under the Dolby brand, or will this be purely a licensing program? We are, and will continue to be a licensing company. We have no intentions to manufacture LCD TVs, LED BLUs, ICs or any other physical product. We will make available to our licensees the use of our HDR technology and also provide them with valuable know-how to assist them in their product development.

Purely anecdotally, tell us how typical consumers react to LCD TVS with Dolby's HDR technology.
Anecdotally, the response for Dolby's HDR technology has been outstanding. This is also backed up quantitatively through primary market research conducted by Quixel Research via consumer surveys in San Francisco and Tokyo in 2007. The results were simply and overwhelmingly positive. Generally, over 80% of people preferred displays with HDR enabled technologies over those using conventional technology. In addition, about 29% were willing to pay $1000 more for a 37-inch LCD TV that utilized Dolby's HDR technology in comparison with conventional LCD TV backlight technology.

As a guess, what percentage of LCD TVs do you predict will incorporate dynamic backlighting solutions in 2009? In 2012? As you know, forecasting is always tricky and I will leave it for the many good analysts to provide their comprehensive insights. However, the trend in the industry to drive towards ever thinner and thinner displays, the drive towards larger and larger displays while consuming less power and hence the corresponding driver towards green products, the drive to differentiate amongst the myriad of brands and products, the need to improve the picture quality, especially the contrast ratio, and the overall trend in the lighting industry towards LEDs in a wide range of applications, the conditions are certainly very favorable for the use of dynamically modulated LED backlighting.

Where can I buy an LCD TV with one of your backlighting solutions? Stay tuned.
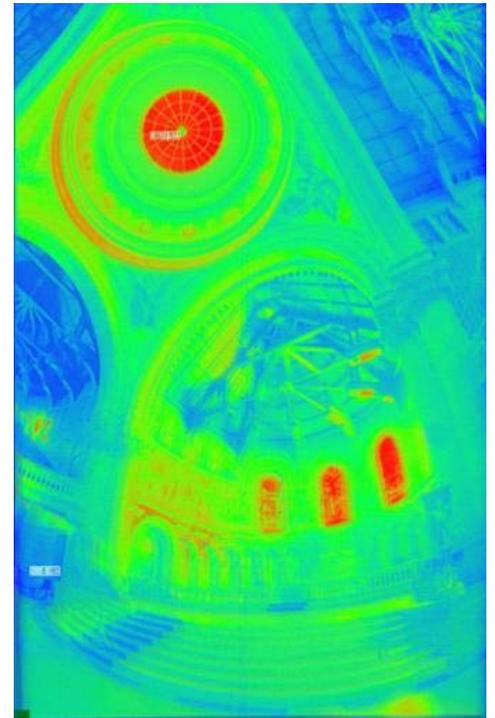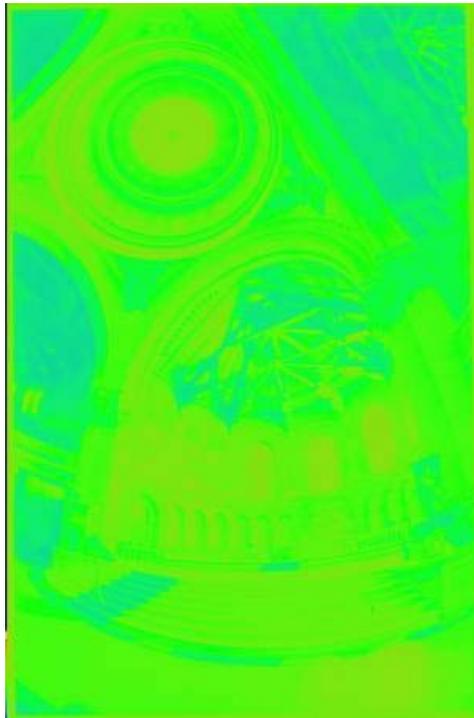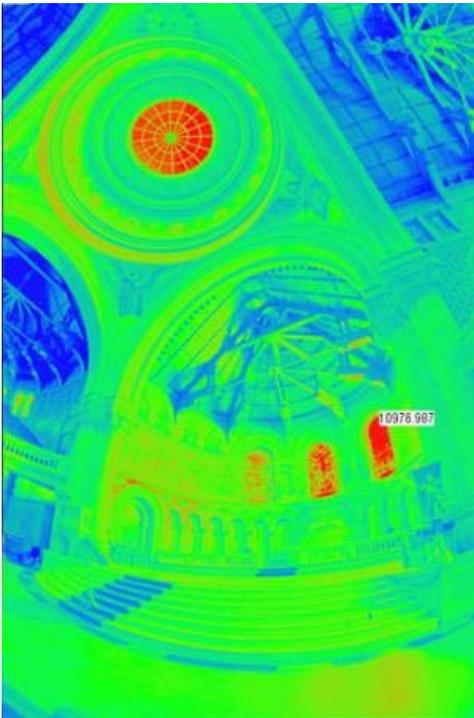
The upper image is Stanford Memorial Church (courtesy of Paul Debevec). Beneath it is a false color map showing the luminance variation in the image, (dark red measure 1687 nits; dark blue is about 0.5 nits). The center image shows the color map represented by a typical LCD display. The right image shows a brightness reproduction from the Dolby high dynamic range display that is much more faithful to the original.

TV video processors and integrated digital processors
Is the sky really falling?

by Henry Choy

Henry Choy is Vice President of TV and Video Research at Jon Peddie Research. He is an industry veteran of 19 years with senior level positions in sales and marketing in the graphics, video, and multimedia markets since 1989. He delivered the first PC-based 3D texture mapping graphics card to Id Software in 1995. He has held various positions in engineering, ISV evangelism, business development, marketing, and sales with a number of leading companies.

ST Microelectronics just completed the Genesis Microchip acquisition, Trident's stock has dropped like a rock, and Pixelworks still can't get itself sold. Is the future so bad that it's just a low cost race to the bottom? So what does the future hold? Most people seem to think that:

- Integration is only game in town.
- The worldwide analog to digital rollover will be like the US and therefore the same assumptions are used for the rest of the world.
- ASPs are dropping like a rock with nothing slowing it down.

It's not as bad as many people may think. JPR is about to launch a new Quarterly ATV Semiconductor report that has some interesting findings to contradict the items above.

Contradiction #1 – Integration is a very important segment but it's not the only segment. Trident's UX/WX has not taken the world by storm with its frame rate control. Sony and Samsung both used their internal solution for their 120Hz TV's. The quality of Trident's solution cannot beat the performance of stand alone solutions. LG has chosen Micronas' Frame Rate Control (FRC) chip for use inside their panel. AMD with its Xilleon panel processor product has found a home inside a few panels from Samsung's SDI group. It now appears everyone is either offering or included in their roadmap an integrated version of FRC. The performance of some of the integrated digital processors (IDP), which integrate MPEG decode with video processing functions, are good enough to be used in 42-inch and below bargain TVs. Don't expect to see them in a 40-inch Sony Bravia line just yet. Sony continues to use a two merchant chip solution in many of their ATSC TVs in the US. Integration is also not the right path in other parts of the world. See contradiction #2.

Contradiction #2 – US's tuner mandate is unique. All the other major regions don't have a tuner mandate. The inclusion of a digital tuner is mostly market and not government driven. In the European Union, the DVB-T market started with set top boxes. The integration of the DVB-T tuner didn't happen until set top boxes dropped well below 100 Euros. The inclusion of an integrated digital processor (IDP) shipping in volume for the DVB-T market will be in 2008. That's several years after the ATSC market. Also, the EU rollover is only for standard definition TV and NOT (I repeat NOT) high definition. That's where H.264 and DVB-T2 will come into play for the EU. DVB-T2 more affectionately known as "T2" spec won't be out until the 1H 2008. There are enough changes in the EU technology requirements that it makes less sense to have a US ATSC type architecture. Integrating demodulation does not make sense if it will change with T2. Integrating H.264 decoding capabilities adds to the complexity of the design and increased silicon area.

Contradiction #3 – The price drop for the exact same part after one year can range from 12 to 16% in the video processor or IDPs. New products that include new features and performance will be priced higher. New competitors from Taiwan are targeting the lower end and pricing aggressively. Pressure from customers also pushes prices down. So what is the overall effect is in the blended ASPs? It's certainly falling but not as fast as many assume. The new ATV report shows that the blended ASP drop in 2008 from 2007 will be only 11%.

The real answer needs to look with levels of detail to include regional effects, technology requirements and the effect of the integration. It's the only way to truly forecast what will really happen to the dynamic changing world of video processor and integrated digital processors. The result of the new report shows life for these segments and won't be like a rock thrown out of an airplane at 30,000 feet.

JPR

May 14, 2008

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Specsmanship: the artistry of sugarcoating performance specifications

by Michael E. Becker

Michael E. Becker is the founder and CEO of Display-Metrology & Systems (DM&S) in Karlsruhe, Germany (http://www.display-metrology.com**), a company providing customer specific and off-the-shelf hard and software solutions for measurement and rating of electronic display visual performance. After completion of his PhD at the University of Karlsruhe and prior to the establishment of DM&S he worked for autronic-Melchers (1985-2001), first as section head, and from 1993 on as a managing director, developing and marketing a range of instruments for measuring LCD visual performance and LCD material and device properties and a software package for numerical modeling of LCD electro-optical performance (DIMOS). Michael has been actively contributing to a variety of international standards for electronic visual display devices (IEC TC110 and ISO TC159/SC4/WG2). In 2006 he received the IEC-1906 Award for his contributions to the IEC standardization activities. He invented a variety of German, European and international patents in the field of optical metrology instrumentation, and he has authored and co-authored numerous technical and scientific papers.**

Specsmanship: "the often inappropriate use of specifications or measurement results to establish putative superiority of one entity over another, generally when no such superiority exists" [Wikipedia], is covering the full range from putting out hyped sensational rumors, spreading urban legends and hysterics to fair data swindle [1].

It usually starts quite innocently: you want to or you have to procure a new desktop computer monitor for your home office or a new television set. In order to get the best performance for the money you will be asked to pay you are trying to spot the performance specifications that are relevant for your intended application as a basis for comparison of different products [2].

When you have a look at the available data you are invited to choose between contrast values of e.g. 500 and 1,000,000 and you may start to wonder how relevant these numbers are for your actual application. At the other end of the scale you are lured by vanishing response times in the range of a few milliseconds, suggesting that shorter response times naturally warrant better display of moving images.

Instead of being confronted with numerous unexplained terms and skyrocketing or vanishing numbers, users of electronic display devices may want to have a reliable (i.e. unbiased), understandable, and reasonable basis of data describing the performance of the product according to its intended application as a solid basis for a purchasing decision [1]. At the same time, however, customers must realize that electronic visual displays have become so sophisticated and complex that their performance just cannot be characterized and rated by a single "figure of merit". Depending on the intended application (e.g. office work, display of video and movies, graphics and design, computer games, home cinema, nomadic ICT devices, etc.) emphasis must be placed on different individual aspects of performance, at least as long as the ideal display device is not available at affordable prices.

This is the first in a series of articles in which we shall present latest specsmanship achievements and in which we shall try to explain which aspects of the performance specifications are of importance for your intended application of a display screen.

Contrast: dreams vs. facts

Contrast values of 1 million? The contrast of display screens based on emission of light (e.g. CRTs and PDPs) are often specified with extremely high values. The contrast of e.g. Sony's "XEL-1" OLED TV-set is specified with a value of 1,000,000 (one million, see e.g. http://www.sonystyle.com).

- Under which conditions can such contrast values be measured?
- How relevant are these contrast values for the actual performance of TV-screens?

These are the questions we try to *illuminate* in this article.

What is the definition of contrast? *Contrast* in visual perception is the difference in appearance of two or more parts of a field seen simultaneously or successively. The visual *contrast* of a display-screen is defined as the (dimensionless) ratio of the *luminance* of a brighter optical state, L_H, and the *luminance* of a darker optical state, L_L. The luminance (specified in cd/m^2) is the physical quantity corresponding to the perception of *brightness*. This quotient is often called "contrast ratio" (CR) and specified as *number: 1* to indicate that it is without dimension.

In most cases it is the **maximum contrast** that can be achieved with a display screen that is specified in the data-sheet. This maximum contrast is given by the luminance of the full-white state (R=G=B=100%) and the luminance of the full-black state (R=G=B=0). The minimum luminance of display screens based on light-emitting technologies (e.g. CRT and PDP) is very low (theoretically zero) and thus the quotient yielding the contrast becomes quite high (theoretically infinite). In real life, the OFF-luminance of PDPs is in the range of 10^{-2} cd/m^2 since the discharge is never completely off and the OFF-luminance of CRTs is in the same range due to afterglow of the phosphors.

In the case of LCDs light is generated by the backlight unit and the LCD-panel in front of the backlight acts as a spatial modulator for the light via electrically controllable transmission. The range of transmission of LCD-cells with color filters is limited by the technology and in the range from 5% to 0.005%. If the luminance of the brightest state is intended to be 200 cd/m^2 the backlight luminance has to be a factor of 1/0.05=20 higher which means it must amount to 4000 cd/m^2. The darkest state of the LCD-screen is then at a luminance of 0.2 cd/m^2 and the resulting contrast value is CR=1000. Two problems arise in that context:

- it turns out to be difficult to measure luminance values < 1 cd/m^2 in a reproducible way, and
- it is difficult to keep a room that dark that no ambient light will corrupt the measurement.

How is contrast measured? The luminance of the bright state of a television screen is (depending on the state of adaptation of the eye of the observer) typically in the range of some 100 cd/m^2. If this luminance is set too high the observer may unpleasantly experience that as *glare*. In order to be able to measure a contrast of 1 million in a laboratory it must be assured that no ambient light (from e.g. LEDs on the operating panel of instruments) is corrupting the dark state of the object of measurement at a luminance of 10^{-4} cd/m^2 (10^{+2} / 10^{-4} = 10^{+6}). It turns out that realization of this condition is not easy. Moreover, luminance values below 10^{-3} cd/m^2 can be measured accurately only with special and thus more expensive instruments.

When the above mentioned conditions are fulfilled, the luminance of the display under test is first measured in the full-white state and then in the full-black state. The contrast evaluated from these measurements under the specified conditions is named ***full-screen sequential dark-room contrast***. This contrast is relatively easy to measure but it does not correlate very much with the contrast that is relevant for the visual experience of a human observer. A kind of contrast more relevant for visual perception is the contrast that is contained in the same visual field and seen at the same moment in time (*concurrent* contrast).

Implications for the dark laboratory: In order to avoid corruption of the black-state of the display under test at a luminance of 10^{-4} cd/m^2 during the measurement the walls of the room must be painted with low reflectance paint (~5% reflectance) and/or be far away from the object of measurement.

Sony OLED TV "XEL-1" as an example

Scenario 1: The TV-screen with a diagonal of 11-inch is located in a **completely dark room**. The screen shows a black square (0 cd/m^2) of 50mm x 50mm on a white background (100 cd/m^2). The screen is 3 m away from a wall with a (diffuse) reflectance of 18% (photographic gray-chart). The screen is assumed to have a specular reflectance of 5% (an ordinary window pane has a specular reflectance of typically 2 x 0.04 = 8%).

Which contrast does the black square have with respect to the white background?

- An 11-inch screen with an aspect ratio of 16:9 has a surface area of 244mm x 137mm = 33.428 10^{-3} m^2
- The light emitting surface thus is 33.428 10^{-3} m^2 – $(0,05 m)^2$ = 30.93 10^{-3} m^2
- The illuminance E of the wall in 3 m distance becomes:
    $$E = (L*A) / d^2 = 100 \ cd/m^2 * 30.93 \ 10^{-3} \ m^2 / 9 \ m^2 = 0.34364 \ lux$$

- The luminance L of the wall then becomes:

  $L = E * \rho/\pi = 0.019689$ cd/m^2 ~ 0.02 cd/m^2

- The luminance reflected from the screen at the location of the black spot then is:

  $L_R = 0.02 * 0.05 = 1\ 10^{-3}$ cd/m^2

- The contrast then becomes:

  $C = 100$ cd/m^2 / $1\ 10^{-3}$ cd/m^2 $= 10^{+5}$

This means that the contrast even under such severe darkroom conditions is reduced from 10^{+6} to 10^{+5} by reflection of the wall illuminated by the bright area of the TV-screen.

Scenario 2: The same TV-screen now is in a dim room at an illuminance of 100 lux (home theater conditions in the living room). This illuminance (we can neglect here the effect from the white TV-screen) causes the wall to have a luminance of 5.7 cd/m^2 (please note that most white wall papers have a reflectance of 70% - 80% instead of the 18% used here!). The luminance of the wall reflected from the black area on the TV-screen then becomes 0.285 cd/m^2 and thus the contrast is 349!

Scenario 3: The same TV screen now is in a room at an illuminance of 300 lux (minimum illuminance for office work). This illuminance (we can again neglect here the effect from the white TV-screen) causes the gray wall to have a luminance of 17.2 cd/m^2 (please note that most wall papers have a reflectance of 70% - 80% instead of the 18% used here!). The luminance reflected from the black spot on the TV screen then becomes 0.86 cd/m^2 and the contrast goes down to 116!
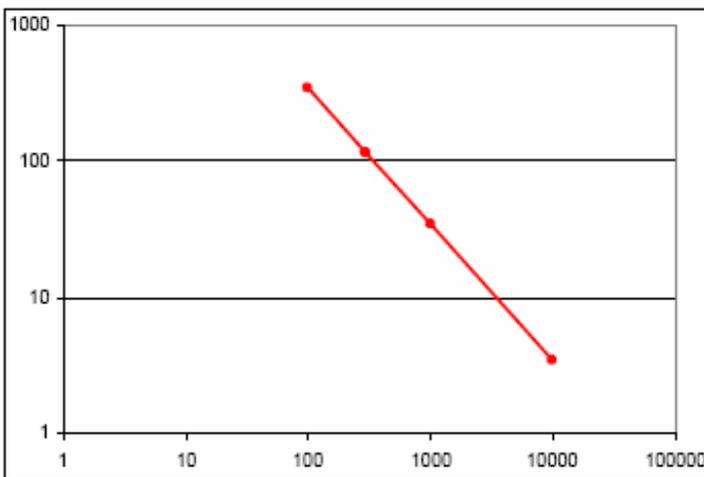
Contrast values versus ambient illuminance (lux) calculated according to the scenarios described above.
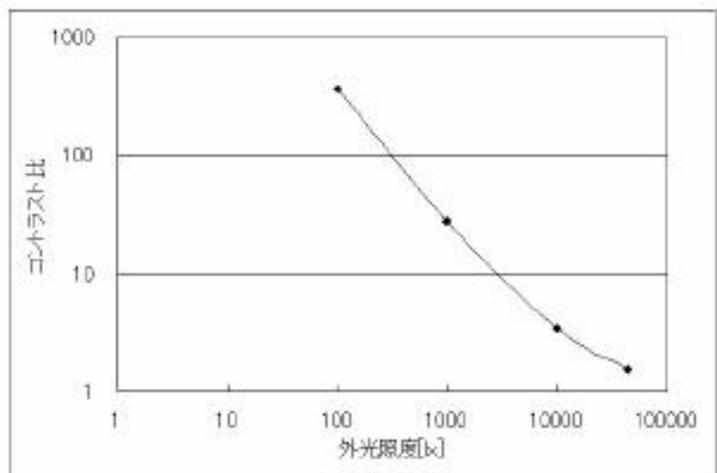
Contrast values versus ambient illuminance (lux) according to measurements published at http://techon.nikkeibp.co.jp.

Contrast values used for specification and demonstration of the performance of display devices in data sheets are usually assessed under special conditions and thus often meaningless for actual application situations. In order to assure good visual performance outside of the dark-room where the measurements have been carried out, i.e. under non-vanishing ambient illumination, effective treatment of the surface of the display-screen to reduce reflections is most important [5, 6].

Measures to reduce display reflectance: For many years all LCD-monitors were provided with a matte surface coating that was scattering incident light and thus reducing unwanted reflections of ambient light sources. Recently, the manufacturers marketing divisions spread the news that a smooth LCD surface provides more saturated colors and a higher contrast and soon, shiny surfaces with attractive names became a distinguishing feature among LCD screens. The improvements suggested by these shiny surfaces can indeed be noticed and measured, but only in a completely dark room when no reflecting object is in front of the display (e.g. white shirts are prohibitive). This tiny condition however is not realized in most of the application situations and thus the promised improvements are practically not relevant.
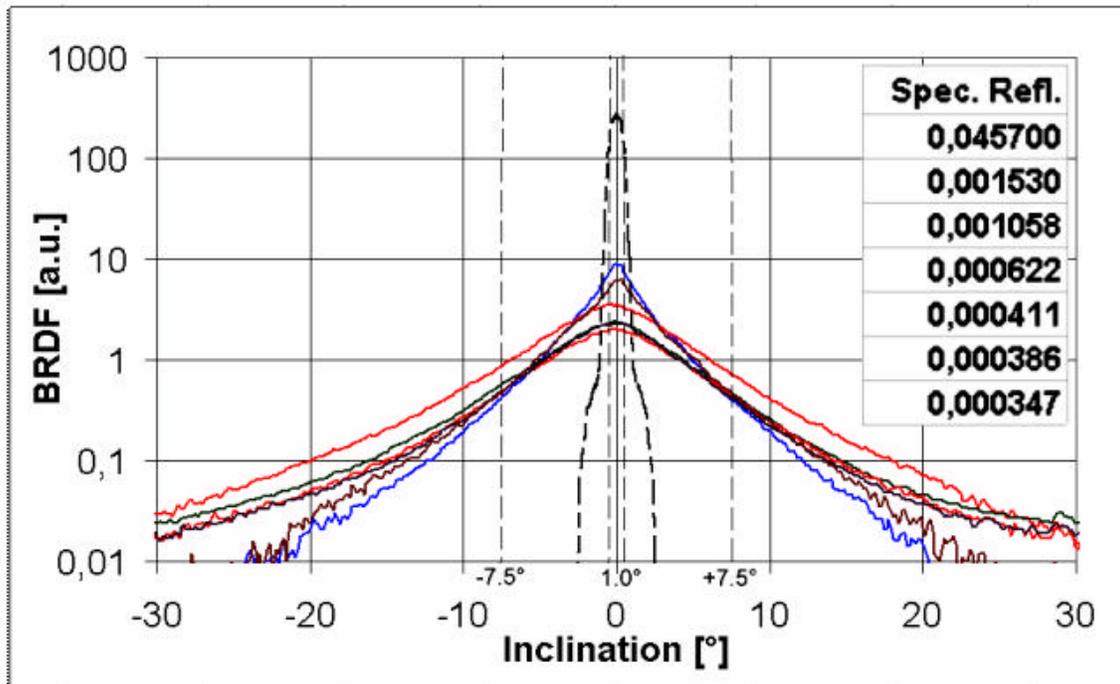
Bidirectional reflectance distribution function (BRDF) of a range of LCD screens showing specular reflectance values in the range of 0.1% - 0.2% for scattering anti-glare coatings (AG), and in the range of 0.06% to 0.03% for combined AG and dielectric anti-reflection coatings [7].

Illustration of the effect of an ambient light source

(Virtual) image of light source in case of specular (mirror like) reflectance.
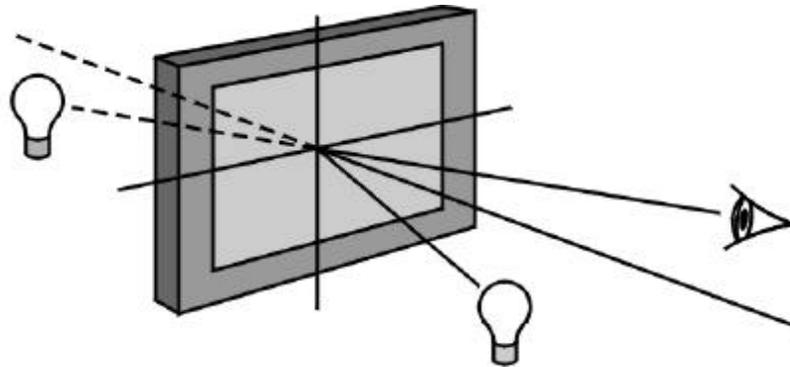
Specular (mirror like) reflection component only, a distinct image of the light source can be seen.
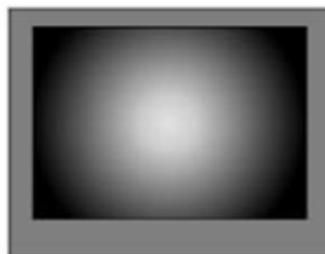
Haze only, maximum of reflected luminance in specular direction, only a fuzzy blurred image of the source can be seen.

Lambertian diffuse reflectance only as known from white printer/copier paper.

The three basic reflectance components together.

Illustrations from E. F Kelley

Reflections from a display screen can be reduced by anti-glare (AG) layers (rough surface with micro-structures that scatter incident light) and by stacks of smooth dielectric films (anti-reflection coatings). AG layers can be recognized by the fact that no distinct images are visible as reflections in the screen (scattering induces *haze*) and AR coatings can be detected by the purple color of originally white light sources reflected via the screen. The most effective reduction of display reflectance is obtained by AG layers combined with AR coatings [7]. Unfortunately this is also the most expensive approach and thus only applied in special cases (e.g. displays for airplanes).

If you are in a store comparing different display screens, the knowledge of the reflection characteristics illustrated in the figures above helps you to find out which technique is used for reduction of display reflectance. Move your head until a light source in the room is reflected in the screen or bring your own test light source (pocket lamps with the reflector removed and held close to one of your ears are well suited). If you see a distinct image of the light source, there is no scattering AG layer. If the image of the originally white light source has a purple tint, an anti-reflection coating is provided. In the consumer electronics field both measures (AG, AR) are combined only in very rare cases. Make sure that you do not buy a display screen without any treatment for reduction of reflectance or a screen with an additional cover plate without anti-reflection measures. This case becomes obvious by a distinct image of the light source without additional purple tint.

The brighter the surround is in which the display screen is intended to be used (e.g. office workplace close to the window or even in a windowed corner) the lower the display reflections must be in order to provide a good contrast and thus the basis for a good visual performance.

References:

[1] M. E. Becker: "Facing the issue of specsmanship in display standards", Veritas et Visus, Display Standard February 2007

[2] M. E. Becker: "Display usability, performance specifications and standards", Symposium on Display Usability: Modeling, Specification, Measurement & Assessment, NPL Teddington, 7th March, 2006.

[3] http://www.sonystyle.com

[4] http://techon.nikkeibp.co.jp/english/NEWS_EN/20071127/143111/

[5] E. F. Kelley: "Diffuse Reflectance and Ambient Contrast Measurements Using a Sampling Sphere", SID ADEAC06 Digest, pp. 1-5

[6] E. F. Kelley, et al.: "Display Daylight Ambient Contrast Measurement Methods and Daylight Readability", JSID 14, 11, pp. 1019-1030

[7] M. E. Becker: "Display Reflectance: basics, measurement, and rating", JSID 2006, 14, 11, pp. 1003-1017

Further reading:

- Don Williams: "Debunking of Specsmanship: Progress on ISO/TC42 Standards for Digital Capture Imaging Performance", IS&T's 2003 PICS Conference, pp. 77-81
- www.6million-pixel.org   see why the number of pixels alone does not sufficiently characterize digital camera performance
- E. F. Kelley : "What Do the Specifications Mean ?", SID04 ADEAC, pp. 15-18

The US Flat Panel Display (FPD) Conference offers extensive market data and analysis of the entire display supply chain including equipment and materials suppliers, panel suppliers, display electronics manufacturers, OEMs, brands, distributors and retailers. Attendees gain critical insights to drive business decisions and foster networking relationships that ensure successful go-to-market strategies.

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EVENT INFORMATION

MARCH 10-13, 2008
Hilton Torrey Pines
La Jolla, California USA

MONDAY, MARCH 10
+ Exhibit Hall Evening Reception

TUESDAY, MARCH 11
+ Display Industry Financial Outlook
+ The Maturing FPD TV Market & Global TV Outlook
+ Fuel For the Display Industry
+ FPD Materials & Equipment Outlook
+ Exhibit Hall Evening Reception

WEDNESDAY, MARCH 12
+ Notebook PCs
  Brand Growth, Mobility Drivers & Emerging Markets
+ Desktop Monitors
  A Market of Never-Ending Growth?

Mar 12 continued

+ Next Generation Display Connectivity Trends & Video Processing Advances
+ OLEDs and Flexible Display Technology When, Where & How
+ Beyond Voice
  Smart and Music Phones Re-create the Mobile Phone Market
+ The Next BIG Display Market Digital Signage
+ Exhibit Hall Evening Reception

THURSDAY, MARCH 13
+ Quest for the Best Looking Picture at the Lowest Cost
+ Towards a New User Interface Touch Panel Market
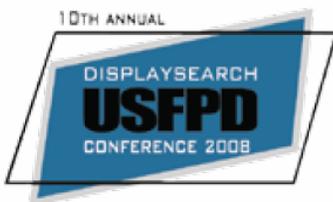
Digital TV switchover: One year and counting

by Andrew Eisner

Andrew Eisner is a former Test Manager for Ziff Davis Labs and is currently Director of Content for Retrevo.com a web site specializing in consumer electronics. Retrevo.com has reviews, manuals, and buying information for all popular gear and gadgets.

When the digital TV switchover happens next year many TV sets will not work. Does it make more sense to replace old TV sets or use a government issued coupon to help pay for a digital TV converter box?

Just about one year from now on February 17, 2009 analog TV signals will be turned off and only digital TV signals will be transmitted over the air. This is the biggest change to standard TV signals since color TVs were introduced over 50 years ago. Despite the fact that many European countries like Sweden and Switzerland have successfully managed the move to digital; the conversion will surely create confusion and distress for millions of TV owners in the United States. A delay seems unlikely as FCC Chairman Martin has expressed his determination to enforce the date, not to mention the fact that some of the soon-to-be unused bandwidth is currently being auctioned off to bidders anxious to use it for wireless communication.

Out of Tuners: NTSC tuners are the components in TV sets, cable boxes, and VCRs that take an analog signal from an antenna, cable, or other connection and turn it into something that you can see and hear on your TV set. Analog tuners are usually connected to external rabbit ears or rooftop antennas. On February 17, 2009 analog signals will not be available over the air and all TVs with NTSC tuners receiving signals that way will need to have ATSC tuners that can work with digital signals.

Cable companies, on the other hand, are not obligated to make the switch to digital and in fact, are required to provide local channels to all subscribers including owners of analog equipment, so most cable users should be okay for now. After things calm down it's quite likely the cable companies will decide they need that analog bandwidth to add more channels in order to compete with the telco's and satellite providers at which point TV owners will face a choice; upgrade or replace. Satellite systems already transmit digital signals and should not be affected by the upcoming switchover.

If you happen to have a TV or device with an analog tuner you have two choices. You can buy a converter box and possibly use a government issued coupon to get a discount or you can replace the old analog-based TV with a brand new digital one.

Converter Boxes: An analog-to-digital converter that takes an ATSC signal, converts it to NTSC, and sends it to channel three on your set. This will most likely be the cheapest solution but maybe not the best. The federal government is offering $40 coupons that consumers can use on a basic converter box. You can request up to two coupons per household now through March 31, 2009. Remember the coupons are only good for 90 days so make sure there is something available to purchase before requesting a coupon. DVRs or DVD recorders come with digital tuners and are reasonably priced, but are not eligible for the government coupons

Some DTV converter boxes are available like the Insignia Digital to Analog Converter Box which costs around $60. Expect to see a much wider selection as the months go by including the recently announced EchoStar TR-40 which is expected to sell for $39.99 and another under $40 unit from Syntax Olevia.

You can use a $40 coupon for a converter box and pay almost nothing out of your pocket; however, a converter box could make for a few hassles. For starters, you'll have another remote to deal with. If you're lucky, your universal remote will work with your old TV and the converter box but Grandma will have to figure out how to switch devices on the remote to raise the volume. You'll also have something else to plug into an outlet and fit on the shelf. Bruce Berkoff, Chairman of the LCD TV Association offers this suggestion, "Why not get a converter box for the old set, move it to the guest room, and buy a new LCD TV for the living room?"

Time to Upgrade: You can also use this opportunity to buy yourself a new TV. Unfortunately you won't get the $40 government subsidy and you may have to pay $10 to recycle the old TV but you should be able to get a more energy efficient flat screen TV and move up to HDTV for under $500 that offers 720p or 1080i resolution and surround sound audio. Bruce Berkoff comments, "Consumers should take advantage of the many sizes, prices, and image enhancement features that flat panel LCD TVs have to offer." Retrevo.com, a website specializing in consumer electronics, analyzes thousands of products, features, ratings, reviews, and prices and then algorithmically selects products with the best bang for the buck. You can find a list of the best values in TV sets on Retrevo.com. Some of the attractive deals in affordable LCD TVs include:

The Syntax Olevia 527V which can be purchased for just over $500. It offers highly rated 720p HDTV in a big 27-inch LCD TV. The Samsung LN-S1951W is a 19-inch LCD TV that gets good user ratings and costs around $400. The Toshiba 20HL67 is a 20-inch HDTV that gets good reviews and will cost you around $450. The Sharp AQUOS LC-19DV22U is a 19-inch 720p LCD HDTV that you can buy for under $500.

Replace the Old VCR: If you haven't made the switch to TIVO or DVR and still have an old VCR between your cable box and TV set, chances are it won't work either when the digital change takes place next year. You can still put a converter box in front of the old unit but you might want to take the opportunity to upgrade the old tape-based VCR to a DVD recorder. You can purchase a DVD recorder that will handle digital signals for under $200 like the Panasonic DMR-EZ17 DVD recorder that has an ATSC/QAM tuner.

How to Tell If Your Set is Digital: If your TV or device says ATSC/QAM on the case or the manual, you're in good shape. If you've misplaced the manual to your TV you can use Retrevo.com's search box to enter your make and model number along with either the word ATSC or QAM and look for results mentioning these digital tuner standards. You can also use the search term "manual," with the make and model number or browse for a manual on Retrevo.com.

Recommended Resources for the DTV conversion:

 Help finding a TV recycling center: http://www.mygreenelectronics.org
 Government site for the DTV conversion and place to get your coupon: https://www.dtv2009.gov
 Consumer Reports Guide to the DTV conversion: http://www.consumerreports.org

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About the LCD TV Association

The LCD TV Association is a global, non-for-profit marketing trade association, formed to help the entire LCD supply chain and retail channel through to the end consumer via various communication tools, including speeches, interviews, sponsored research, as well as industry newsletters, meetings and standards settings – resulting in better information and distribution of this information, as well as better understanding of the rapidly changing world of flat TVs and HDTVs for all related parties. Participating at the many industry trade and consumer shows around the world to help promote members' interests, as well as create better LCD TV products for everyone, our goal is to serve both the industry needs and promote the consumers best interests. We encourage and engage in discussions to promote the industry overall, as well as helping foster healthy competition and create better products with higher value propositions for consumers and retailers alike. The LCD TV Association can help fight the growing "specsmanship" in trade publications and refocus conversations on true image quality and understanding for consumers, and help the whole LCD TV ecosystem to improve and thrive. For more information on the LCD TV Association, it's membership, or to join at one of the various levels available, please visit us on the web at http://www.LCDTVAssociation.org.

Commentary: Dueling surveys

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 consumer electronics markets, at *http://hdtvprofessor.com/HDTVAlmanac*.
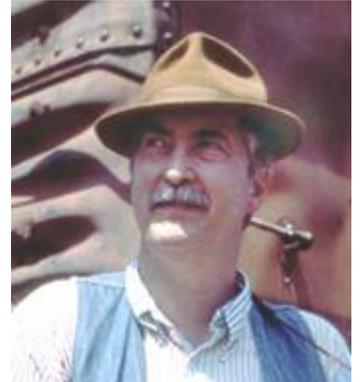
The clock is about to start on the one-year countdown to the end of analog over-the-air transmission by local television broadcasters. The US Congress has been concerned that Americans may not be aware of the transition to digital broadcasts, or of the government rebate program for digital converters.

A survey commissioned by the National Association of Broadcasters (NAB) paints a rosy picture of the situation. According to a press release in January, 79% of US television households were aware of the February 17, 2009 cut-off date. Among households that rely on over-the-air broadcasts, the awareness level increases to 83%. This is up from 38% from a year ago. The NAB states that about 34 million US households rely on over-the-air broadcasts.

But not so fast! Consumer Reports also issue a press release in January, providing the results of their own survey. They found that 36% of US television households were completely unaware of the digital TV transition next year. According to the survey, 15% of all Americans rely on over-the-air programming, and 78% of them have analog sets. Consumer Reports estimates that this means that about 23 million people won't be able to get television programming next year.

The survey also found that 58% of the respondents who are aware of the transition think that all televisions will need a converter box. 48% think that only digital televisions will work, and 28% think that they will have to throw out all analog televisions. The truth is that the transition will not affect anyone who relies on cable or satellite service for their television programming. All satellite services are already digital, and it's between you and your cable company whether you have analog or digital service. In any case, your set top box will not be affected by the end of analog broadcasts. If you get your television programming over the air, then you will need either a set with a digital tuner, or a converter box that will allow you to continue to use your existing analog TV.

The differences between these two surveys are not as great as they seem; the awareness level is between 64% and 79%. The difference is whether you take a glass-half-full or glass-half-empty view of the numbers. If I had to pick one, I'd lean toward the Consumer Reports interpretation. There is a huge amount of confusion out there about who will be affected by the transition and what they should do about it. Every day since New Year's, my HDTV Almanac entry about the government rebates for the digital converters has received almost as many hits as the day's new entry.

There's a dark underbelly to this issue as well. I don't have any numbers on this, but I strongly suspect that there's a large correlation between the people who only get their programming over the air and those who have low awareness of the impending change. Furthermore, I suspect that many of these people tend to have lower incomes, and are least likely to be able to afford a replacement television. (Let's face it, not everyone can afford cable service even though it may seem like a necessity to some.) The good news here is that some of the converter boxes are already appearing at the $40 price point, which will make them free with a government rebate voucher. The question is whether or not the millions of Americans who need these boxes the most – yet can least afford them – will get in on the voucher program before it's too late.

If you understand the conversion situation, you should talk about it at social gatherings. You'll find that a lot of your friends, family, and neighbors are confused, and they'll appreciate a simple explanation of what it's all about. (Or you could just send them to the HDTV Almanac for more information.) It's clear that a large number of people don't understand what they're facing, and what they should do about it.

2008 Display Industry Calendar of Events

A detailed calendar with active URLs is maintained by Veritas et Visus. Please notify mark@veritasetvisus.com to have your future events included in the listing. http://www.veritasetvisus.com/industry_calendar_2008.htm.

January 2008			
January 6-9	Game Power and Mobile Entertainment	Las Vegas, Nevada	
January 7-10	2008 International CES	Las Vegas, Nevada	
January 9-13	International Conference on Consumer Electronics	Las Vegas, Nevada	
January 11	LEDs in Displays	Costa Mesa, California	
January 14-18	MacWorld Expo	San Francisco, California	
January 15-16	Metalization and Dielectrics	Stratford-upon-Avon, England	
January 17	Practical Light & Color Measurement	Birmingham, England	
January 19-24	Photonics West 2008	San Jose, California	
January 21-24	Flexible Microelectronics and Displays Conference	Phoenix, Arizona	
January 22-24	ATEI 2008	London, England	
January 24	Korea FPD Conference	Seoul, Korea	
January 27-31	Electronic Imaging 2008	San Jose, California	
January 28-30	Stereoscopic Displays and Applications	San Jose, California	
January 29-31	Integrated Systems Europe 08	Amsterdam, Netherlands	
January 30-31	Japan Forum	Tokyo, Japan	
January 30-31	Grand Challenges for Emerging Technologies in Displays	Cambridge, England	
January 30 - February 1	Video Forum Europe	London, England	
January 30 - February 1	Semicon Korea	Seoul, Korea	
February 2008			
February 5-6	Screen Expo Europe	London, England	
February 7	AC Electroluminescence	Swansea, Wales	
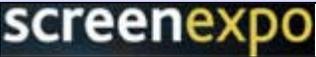
February 7-9	**CEA 2008 Winter Retreat**	**Park City, Utah**	
February 11-13	**Strategies in Light Conference**	**Santa Clara, California**	
February 12-15	**Display Metrology Short Course**	**Boulder, Colorado**	
February 13-14	**Image Processing and Optical Technology**	**Birmingham, England**	
February 15-17	**Symposium on Interactive 3D Graphics and Games**	**Redwood City, California**	
February 16-21	**Medical Imaging**	**San Diego, California**	
February 18-22	**Game Developers Conference**	**San Francisco, California**	
February 20-21	**RFID Smart Labels**	**Boston, Massachusetts**	
February 22-24	**Sound & Vision 2008**	**Bristol, England**	
February 24-27	**Focus on Imaging**	**Birmingham, England**	
February 26	**Transistors on Plastic**	**Maccelsfield, England**	
February 27-28	**Electronic Displays 2008**	**Nuremberg, Germany**	

March 2008

March 3-4	**Business Goes Green**	**San Jose, California**	
March 3-5	**Global Phosphor Summit**	**San Diego, California**	
March 3-6	**O'Reilly Emerging Technology Conference**	**San Diego, California**	
March 4-9	**CeBIT 2008**	**Hanover, Germany**	
March 5-6	**LED China 2008**	**Guangzhou, China**	
March 6	**HD Expo**	**Beverly Hills, California**	
March 6	**Displaybank New York Conference**	**New York, New York**	
March 8-9	**Symposium on 3D User Interfaces**	**Reno, Nevada**	
March 8-12	**Virtual Reality 2008**	**Reno, Nevada**	
March 10-13	**Showest 2008**	**Las Vegas, Nevada**	
March 10-14	**2008 Measurement Science Conference**	**Anaheim, California**	
March 11-12	**Investigating 3D Technologies and Projection Displays**	**Leicester, England**	
March 11-13	**FPD China**	**Shanghai, China**	
March 11-13	**Air Traffic Control**	**Amsterdam, Netherlands**	

March 11-13	US FPD Conference	San Diego, California	
March 11-15	EHX	Orlando, Florida	
March 12-13	Media Summit	New York, New York	
March 12-14	DVB World 2008	Budapest, Hungary	
March 13-14	Microdisplays, Applications, and Optics	Jena, Germany	
March 13-14	Symposium on Haptic Interfaces and Virtual Environments	Reno, Nevada	
March 17-19	Digital Holography and Three-Dimensional Imaging	St. Petersburg, Florida	
March 18-19	Digital Living Room	San Francisco, California	
March 18-20	Semicon China	Shanghai, China	
March 18-20	electronica & ProductronicaChina 2008	Shanghai, China	
March 20	Display Material & Device Business Forum	Taipei, Taiwan	
March 24-25	Future of Television	Los Angeles, California	
March 26-28	Eye Tracking Research & Applications	Savannah, Georgia	
March 26-29	International Sign Expo	Orlando, Florida	
March 28-30	Sign Today	New Delhi, India	
March 31 - April 2	IPTV 2008	Berlin, Germany	
March 31 - April 3	Digital Signage 2008	San Francisco, California	
April 2008			
April 1	Lighting for Mood, Health, and Well-being	London, England	
April 1-3	Display 2008	Paris, France	
April 1-3	Foundation in Displays	Nottingham, England	
April 5-10	CHI 2008	Florence, Italy	
April 7-11	Photonics Europe	Strasbourg, France	
April 7-11	MIPTV	Cannes, France	
April 8-9	Printed Electronics Europe	Dresden, Germany	
April 9-10	AMOLED and Flexible Displays	Seoul, Korea	
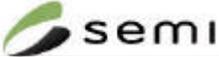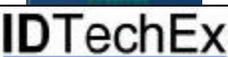
April 9-12	**Global FPD Partners**	**Miyazaki, Japan**	
April 10-11	**RTT 3D Realtime Visualization Conference**	**Vienna, Austria**	
April 11-17	**NAB 2008**	**Las Vegas, Nevada**	
April 12-13	**Digital Cinema Summit**	**Las Vegas, Nevada**	
April 13-18	**CEA 861/HDCP PlugFest**	**Milpitas, California**	
April 14-15	**International Integrated Manufacturing by Printing Colloquia**	**Gregynog, Wales**	
April 14-15	**Inkjet Academy: Theory of Inkjet Technology / Manufacturing Process Symposium**	**Denver, Colorado**	
April 14-17	**Hong Kong Electronics Fair Spring**	**Hong Kong, China**	
April 14-18	**EuroGraphics**	**Crete, Greece**	
April 15	**Mobile TV & Video Summit**	**Las Vegas, Nevada**	
April 15-16	**2nd Annual International Film Festival Summit Europe**	**London, England**	
April 15-17	**iSuppli European Briefing**	**Lisbon, Portugal**	
April 15-17	**LED Packaging 2008**	**Penang, Malaysia**	
April 16	**Broadband TV World**	**Las Vegas, Nevada**	
April 16-18	**FineTech Japan & Display 2008**	**Tokyo, Japan**	
April 16-18	**Inkjet Technology Supplier's Showcase**	**Denver, Colorado**	
April 17-18	**2008 Taiwan FPD Conference**	**Taipei, Taiwan**	
April 21-23	**Organic Photovoltaics**	**Philadelphia, Pennsylvania**	
April 22-24	**Sign UK/Digital Signage Showcase**	**Birmingham, England**	
April 25	**Business Goes Green**	**New York, New York**	
April 28-30	**Innovative Lighting & Design**	**Dearborn, Michigan**	
April 29 - May 1	**Worship Facilities Conference & Expo**	**Indianapolis, Indiana**	
April 30 - May 2	**CEDIA Electronic Lifestyles Forum**	**Dallas, Texas**	
	May 2008		
May 5-7	**SEMICON Singapore**	**Singapore**	
May 5-7	**Smart Fabrics 2008**	**Charleston, South Carolina**	

May 5-8	**Digital Hollywood Spring**	**Los Angeles, California**	
May 6-7	**Introduction to Printing for Micro Manufacture**	**Swansea, Wales**	
May 8-9	**Plastic Electronics Workshop**	**Cardiff, Wales**	
May 13-16	**Symposium on Virtual and Augmented Reality**	**João Pessoa, Brazil**	
May 14	**Integrated Digital TV Conference**	**Taipei, Taiwan**	
May 14	**Digital Book 2008**	**New York, New York**	
May 15-16	**BLU & LED Seminar**	**Seoul, Korea**	
May 15-18	**SIIM 2008**	**Seattle, Washington**	
May 18-23	**SID International Symposium**	**Los Angeles, California**	
May 19-21	**International Symposium on Electronics and the Environment**	**San Francisco, California**	
May 19-23	**2008 Technology & Standards Forum**	**Nashville, Tennessee**	
May 20-21	**DisplaySearch China HDTV Conference**	**Guangzhou, China**	
May 20-22	**CeBIT Australia**	**Sydney, Australia**	
May 20-23	**Orbit-iEX**	**Zurich, Switzerland**	
May 21-23	**Asia Flat Panel Display Industry Expo**	**Guangzhou, China**	
May 23	**Shenzhen FPD Conference '08**	**Shenzhen, China**	
May 25-27	**International CES/Hometech**	**Dubai, UAE**	
May 26-28	**EuroVis 2008**	**Eindhoven, Netherlands**	
May 26-30	**Lightfair**	**Las Vegas, Nevada**	
May 28	**Digital Signage Conference**	**Chicago, Illinois**	
May 28-30	**Graphics Interface 2008**	**Windsor, Ontario**	
May 28-30	**3DTV Conference**	**Istanbul, Turkey**	
June 2008			
June 1-5	**Nanotech 2008**	**Boston, Massachusetts**	
June 3-5	**Dimension 3 Expo**	**Chalon sur Saône, France**	
June 3-7	**Computex 2008**	**Taipei, Taiwan**	

June 4-5	EuroLED 2008	Birmingham, England	
June 5	High Def Expo	Chicago, Illinois	
June 6	Business Goes Green	San Jose, California	
June 9-13	European Conference on Color in Graphics, Imaging, and Vision	Terassa, Spain	
June 11-12	ITO & Touchscreen Panels	Seoul, Korea	
June 11-13	Display Taiwan 2008	Taipei, Taiwan	
June 11-13	Photonics Festival: OPTO Taiwan , SOLAR, LED Lighting, Optics	Taipei, Taiwan	
June 12-14	Digital Downtown	New York, New York	
June 14-20	InfoComm '08	Las Vegas, Nevada	
June 16-17	Projection Summit	Las Vegas, Nevada	
June 16-19	International Conference on Organic Electronics	Eindhoven, Netherlands	
June 17-18	Photovoltaics US	Denver, Colorado	
June 18-20	Photovoltaics Summit	San Diego, California	
June 19	Communications Goes Green	Las Vegas, Nevada	
June 23-26	Cinema Expo	Rotterdam, Netherlands	
June 24-26	CEDIA Expo UK	London, England	
June 24-26	Plastic Electronics Asia	Seoul, Korea	
June 24-27	FPD Expo/LED Expo	Seoul, Korea	
June 25-27	Industrial Virtual Reality Expo & Conference	Tokyo, Japan	
June 25-27	Electronic Materials Conference	Santa Barbara, California	
July 26-29	Taitronics Bangkok 2008	Bangkok, Thailand	
June 27-29	Flat Panel Display Technology and Equipment Exposition	Beijing, China	
June 27-29	International LED Exposition	Beijing, China	
July 2008			
July 2-4	International Workshop on Active Matrix FPD & Devices	Tokyo, Japan	
July 3-4	Korea Display Conference 2008	Ilsan, Korea	

July 3-6	Imaging Expo China	Shanghai, China	
July 7-9	Eurographics/SIGGRAPH Symposium on Computer Animation	Dublin, Ireland	
July 8-11	Information Visualization	London, England	
July 9-14	National Stereoscopic Association 2008 Convention	Grand Rapids, Michigan	
July 10-13	SINOCES	Qingdao, China	
July 15-17	Semicon West 2008	San Francisco, California	
July 30-31	DisplaySearch Japan Forum	Tokyo Japan	
July 30 - August 1	CEDIA Expo Asia Pacific	Sydney, Australia	
August 2008			
August 9-10	Web3D 2008 Symposium	Los Angeles, California	
August 10-14	Optics & Photonics	San Diego, California	
August 11-16	SIGGRAPH 2008	Los Angeles, California	
August 19-22	Display Metrology Short Course	Boulder, Colorado	
August 24-26	Australasian Gaming Expo	Sydney, Australia	
August 29 - September 3	IFA 2008	Berlin, Germany	
September 2008			
September 2-5	electronicIndia	Bangalore, India	
September 3-4	PDP Tutorial	Seoul, Korea	
September 3-7	CEDIA Expo 2008	Denver, Colorado	
September 5-6	International Workshop on Image Media Quality and its Applications	Kyoto, Japan	
September 7-10	PLASA '08	London, England	
September 9-11	Semicon Taiwan, 2008	Taipei, Taiwan	
September 10-12	InterOpto '08	Tokyo, Japan	
September 11-13	Taitronics India 2008	Chennai, India	
September 11-16	IBC 2008	Amsterdam, Netherlands	
September 14-16	Inter-Society Color Council Annual Meeting	Baltimore, Maryland	
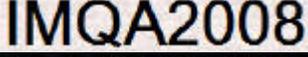
September 23-24	Mobile Displays 2008	San Diego, California	
September 23-28	Photokina	Köln, Germany	
September 29 - October 1	Organic Electronics Conference	Frankfurt, Germany	
September 29 - October 1	LEDs 2008	San Diego, California	
September 29 - October 2	EOS 2008	Paris, France	
September 30 - October 4	CEATAC Japan 2008	Tokyo, Japan	
October 2008			
October 1-2	KioskCom Europe	London, England	
October 1-3	Display 2008	Moscow, Russia	
October 2-3	Tabletops and Interactive Surfaces 2008	Amsterdam, Netherlands	
October 7-8	Taiwan FPD Conference '08	Taipei, Taiwan	
October 7-9	SEMICON Europa 2008	Stuttgart, Germany	
October 7-9	Printed Electronics Asia	Tokyo, Japan	
October 7-11	Taipei Int'l Electronics Autumn Show	Taipei, Taiwan	
October 7-12	CeBIT Bilisim EurAsia	Istanbul, Turkey	
October 13-16	ElectronicAsia 2008	Hong Kong, China	
October 13-16	Hong Kong Electronics Fair Autumn	Hong Kong, China	
October 13-16	Showeast	Orlando, Florida	
October 13-17	IMID 2008	Ilsan, Korea	
October 13-18	IMID/IMDC/Asia Display 2008	Ilsan, Korea	
October 14-17	Korea Electronics Show	Seoul, Korea	
October 15-19	CEA Industry Forum	Las Vegas, Nevada	
October 16-17	SID Vehicles and Photons	Dearborn, Michigan	
October 15-18	SMAU 2008	Milan, Italy	
October 19-22	AIMCAL Fall Technical Conference	Myrtle Beach, South Carolina	
October 19-23	GITEX 2008	Dubai, UAE	
October 20-23	SATIS 2008	Paris, France	
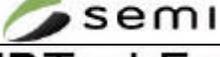
Date	Event	Location	
October 20-24	Technology & Standards Fall Forum	Las Vegas, Nevada	CEA
October 27-30	CeBIT Asia	Shanghai, China	CeBIT
October 29-30	Plastic Electronics	Berlin, Germany	Plastic Electronics
October 29-30	High Def Expo	Burbank, California	HD
October 29-31	FPD International	Yokohama, Japan	FPD International
October 30 - November 1	Integrated Systems Russia	Moscow, Russia	infoComm
November 2008			
November 3-6	IDRC	Orlando, Florida	SID
November 4-6	Digital Video Expo East	Los Angeles, California	DV expo
November 4-7	EHX Fall 2008	Long Beach, California	EHX
November 5-6	DisplayForum	Dusseldorf, Germany	meko
November 10-15	Color Imaging Conference 2008	Portland, Oregon	SID IS&T
November 11-14	electronica	Munich, Germany	
November 11-16	SIMO 2008	Madrid, Spain	SIMO
November 13-14	Future of Television	New York, New York	FUTURE OF TELEVISION
November 18-21	Display Metrology Short Course	Boulder, Colorado	NIST FPDL
November 19-21	InfoComm Asia	Hong Kong, China	infoComm
November 30 - December 5	RSNA 2008	Chicago, Illinois	RSNA
December 2008			
December 2-3	Forum 'be-flexible'	Munich, Germany	IZM Reel to Reel
December 3-4	Display Industry Equipment Forum	Seoul, Korea	Displaybank
December 3-4	Printed Electronics US	San Jose, California	IDTechEx
December 3-5	International Display Workshops	Niigata, Japan	SID
December 3-5	SEMICON Japan	Tokyo, Japan	semi
December 9-10	Hollywood Goes Green	Los Angeles, California	BUSINESS GOES GREEN
December 9-11	CineAsia	Macau, China	CINE ASIA
December 10-13	SIGGRAPH Asia	Singapore	SIGGRAPH

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