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# **“LCD TV Matters”**

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**Volume 5, Issue 1**



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

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# Chairman's Corner: Samsung vs. Apple, LCD vs. OLED, Us vs. Them, and other Silly vs. Smart queries...

by Bruce Berkoff

Over the past many years, we have seen the display industry go through many convolutions and many apparent battles, some of them more real than others.

One of the highest profile "battles" has been the ongoing IP law suits between Apple and Samsung, played out on many a nightly news worldwide. Many people have said this seems to be a big waste of time and money, except of course for the well rewarded lawyers involved on both sides. It is also, perhaps, quite an innovative use of legal maneuvers in lieu of more marketing budgets (you simply cannot buy the kind of press this story has generated globally!). This is the best PR a lawyer can buy! They have kept buzz on TV and front page coverage, like an ongoing super bowl or world cup event in the courtroom, but mainly focused on phones people love, or love to hate, and the rounded rectangles they use on them.

People have been touched by the need to multi-touch, and swipe their way through the day. Android vs. iOS is just like the old Mac vs. PC, or coffee vs. tea, or Dallas vs. New York – there is always another "us vs. them" or "home vs. away" in the never ending sport of "spy vs. spy" we love to watch, and cheer and opine on!

Anyway, it is strange to see the company that Steve Jobs once bragged would "shamelessly steal good ideas" sue someone for maybe stealing a good idea or two, but these are strange times indeed. (Is a green rectangle icon with a phone inside really worth a \$billion to someone)? Then again, how hard is it to change something like that a bit, though Windows used a trash icon in the lower right corner, as did the Mac, but they "borrowed" that from the Xerox star, right?

However, does any of this help the consumer have better products? Does it protect innovation as some may claim? How does a company traverse the competitive landscape without crashing into a mountain? How does one company survive the trip between high peaks to make it to the beautiful lake? (See figure 1).

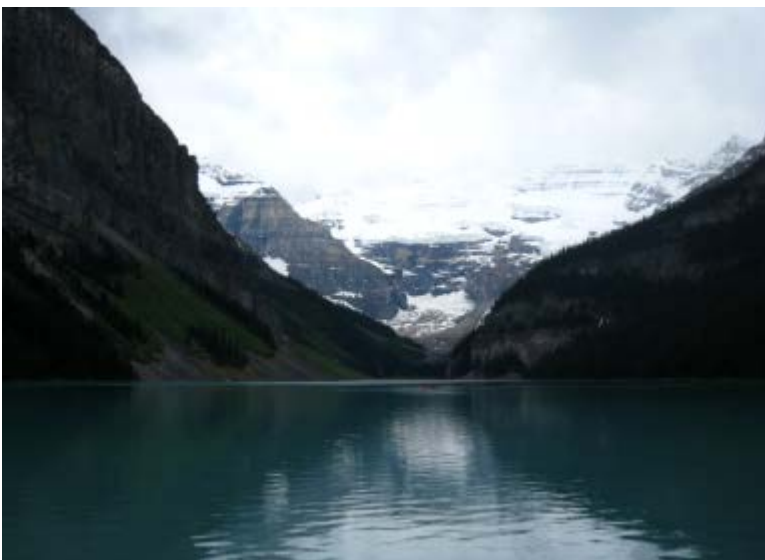


Figure 1: Stunning lake image; Figure 2: Pink sky – sunset or sunrise?

And what about the 15-year-old discussion of LCD vs. OLED? OLED has always been the technology of tomorrow, and some think it always will be.

Does a picture of a pretty pink sky over a mountain represent a sunset or a sunrise? Is it a new age coming, or one ending? (See figure 2). Well, I think those of us in the industry know how hard it is to manufacture new things, especially new types of display technology. It takes a while. Sometimes things take quite a long time. At SID many years ago, I asked people to remember Berkoff's Law (My personal rule of Technology Manufacturing) which states: "Science always loses to Engineering, and Engineering always loses to Economics, and Economics always loses to Politics", which help me predict that LCD TV's would outsell PDP TVs 10 to 1 for many years in a row.

About 22 months ago, both Samsung and LG showed off OLED TVs at CES. Now they both state they will soon ship new curved OLED TV into the US real soon. (See figure 3). Do people really want their new flat screen TV technology to be curved, not flat? Will a \$13,000 TV set sell in volumes enough to drive the costs down? The later question is one those who follow display technology can more easily answer, which is not any time soon. At the recent SID, one recently retired Korean executive was asked "when will Best Buy sell a \$1000 OLED TV" and he answered just like I would have, which was "maybe 10 years, maybe never". The details of why this is obvious to those of us in the industry is a much longer discussion, but suffice it to say, things take time (and require equipment, and factories, and scale). It was hard for people to realize that mountains and islands came from earthquakes and volcanoes, as the time scales involved are so different from what people are used to. (See figure 4).

*OLED TV with a curved screen*



Lest we digress too much, let's not forget other recent "big news" in the display world, one was the great hope of "3D TV". Many folks were thinking people would do anything to see another dimension on their TVs, like where glasses while watching their shows. (See figure 5). While many people were worrying about content for the sets (ignoring the various ways it can be created in-line), not enough worried about whether 3D was a set, or a feature. Like "smart" TVs, it proved to be a valid feature of a set, but not another category.



*Figure 4: Geological timeframes... Figure 5: Glasses don't always work...*

What will this next year prove in the market and technology race for displays? Will the iTV finally happen (long overdue in any event)? Will an iWatch create another new category like the iPhone did? Will various new display



# LCD TV News

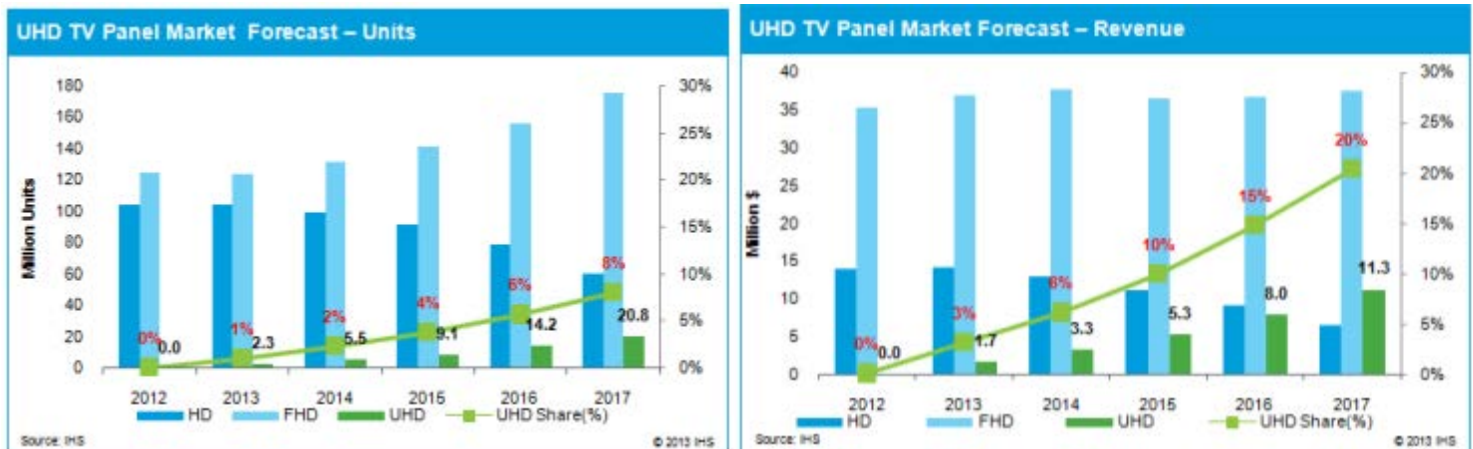
compiled by Veritas et Visus

## 2014 CES to feature advancements in ultra HD technology

The 2014 International Consumer Electronics Show will showcase the latest advancements in ultra-high-definition technology via exhibits and new conference programming. 4K delivers four times the resolution of today's full high-definition TVs, with more than eight million pixels of resolution. Sony, Panasonic, Samsung, LG, Toshiba, Sharp and Hisense are a few of the manufacturers who will be showcasing this technology. The show will feature 20 market-specific TechZones highlighting innovation across 15 different product categories. Consumer Electronics Association now forecasts 4K unit shipments to reach 450,000 in 2014. Consumer Electronics Association will produce "Ultra HD Content: What Will We Watch in 2014 and Beyond?". "Seeing is Believing – 3D, 4K and UHD" will take place on January 9 and will be produced by the International 3D and Advanced Imaging Society, an official CES conference partner. <http://www.ce.org>

## Larger screen sizes and higher resolution are driving TV panel demand in a struggling market says IHS

The TV market has experienced a significant slowdown in growth over the past couple of years and, with OLEDs delayed, there have been no significant new premium features to drive consumer interest and spur replacement demand, according to IHS. Late in 2012, panel makers began to aggressively push new ultra-high definition panels (UHD) 3840x2160, intended for the larger sized TV panels, a more profitable segment of the TV panel market. UHD TV panels reached 0.4 million units in the second quarter of 2013, up 142% Q/Q, with a forecast of 0.8 million units for the third quarter, a 107% Q/Q increase. While penetration, by unit, into the TV panel market will be just 1% in 2013, it should rise to 8% in 2017. Penetration by revenue will rise much faster, reaching 20% by 2017. UHD TV panels are primarily found in a limited number of the larger size panels, but it will quickly diversify into a large variety of panel sizes from between 3.x-inch and to over 100-inch panels. While 50-inch and 55-inch panels currently predominate, in 2017 there will be 2.6 million 60-inch panel shipped with UHD, 2.3 million 42-inch panels, 2 million 39-inch panels and 48-inch panels shipped with UHD. Although panel suppliers are very aggressive for UHD displays, there are obstacles to market growth of insufficient content, inefficient production, high price and insufficient capacity, that panel and set makers must solve to realize the full potential of UHD products. This report presents an in-depth analysis of large LCD panel shipments, size, resolution, backplane technology and panel makers. It also provides a market outlook of panel shipments by unit and area, by value, and by size, with a market analysis of the outlook for average selling price and unit area price. Each application receives its own in-depth analysis based on its particular market issues and outlook. <http://www.ihs.com>



## NEC Display's new 27-inch display built on wide color LED backlight

NEC Display Solutions of America announced the latest additions to its MultiSync PA Series of displays. The 27-inch PA272W color accurate display and PA272W color critical display with SpectraViewII calibration software and sensor come in both white and black cabinets. The redesigned monitors are built on GB-R LED backlights, which mean that the PA272W provides a wider color gamut and more color control than a conventional white LED

backlight, and consumes 37% less power than comparable CCFL backlights. The 27-inch monitor is designed with a fully ergonomic stand and features a 2560x1440 resolution. Its 10-bit wide color gamut AH-IPS LCD panel provides the accurate, vibrant colors professionals require. It also showcases the time-saving features common to the MultiSync PA Series displays, including the ability to load ICC profiles to emulate custom color spaces and easily match prints. In addition, the free MultiProfiler software, exclusive to the MultiSync P & PA Series, provides easy-to-use control over most display settings, including print matching with Picture Mode presets as well as Picture in Picture and Picture by Picture window configurations. MultiProfiler also allows users to manage the monitor's USB hub and enables keyboard shortcuts for changing inputs and Picture Modes. The MultiSync PA272W and PA272W-BK-SV include the following features: 10-bit active matrix AH-IPS panel with GB-R backlight and no-sparkle, antiglare coating; 2560x1440 resolution at 109ppi; 350cd/m<sup>2</sup> brightness and 1000:1 contrast ratio at 37% less power than CCFL; near perfect (99.3%) coverage of Adobe RGB and 100% of sRGB color space; internal 14-bit programmable 3D lookup table (LUT); comprehensive input panel, including DisplayPort, mini-DisplayPort, HDMI and DVI-D; built-in USB hub (2 up, 3 down) with DisplaySync Pro to control two computers with only one keyboard and mouse; 4-way ergonomic stand (150mm height-adjust with locking base, tilt, swivel and pivot) with quick-release capability; the PA272W-BK-SV includes the SpectraViewII Color Calibration Solution, which features software and colorimeter to provide automated monitor matching and calibration for accurate, consistent and repeatable color performance; optional accessories, which include a Mini DisplayPort to DisplayPort cable (PA-MDP-CABL) for connecting devices using Mini DisplayPort or Thunderbolt technology, display hood (HDPA27), SpectraViewII software (SVIISOFT), NEC custom colorimeter (MDSVSENSOR3), complete SpectraViewII Color Calibration Solution (SVII-PRO-KIT) and 2W USB sound bar (SOUNDBARPRO). <http://www.necdisplay.com>

#### **Toshiba 4K Ultra HD TV series now available at US retailers**

Toshiba's Digital Products Division (DPD), a division of Toshiba America Information Systems, announced the L9300U Series of 4K Ultra HD TVs is now available at select US retailers in 58, 65 and 84-inch screen sizes. For a limited time, Toshiba will be providing the BDX6400 4K Upscaling Symbio Blu-ray Player and the SBX5065 300 Watt Sound Strip free with 4K Ultra HD TV purchases. The Toshiba L9300U Series TVs are powered by Toshiba's proprietary second generation CEVO 4K Quad+Dual Core Engine. Sophisticated technology such as Resolution Restoration, Color Restoration and Surface Brilliance Enhancement create pristine, life-like images that are unlike what most people have seen before. These models also feature a stylish design with gun-metal trim and matching frame stand to deliver a modern, yet elegant, appearance. The new Toshiba L9300U Series TVs deliver the ultimate viewing experience for movies, sports, video games, photo viewing, and more, the company says. Although these units are shipping with HDMI 1.4 level capability, Toshiba will also provide a free firmware upgrade to HDMI 2.0 level capability this December 2013 to support 4K 60fps content. In addition to industry leading 4K image processing, the L9300U Series includes a suite of technologies that enhance picture quality, including: ClearScan 240Hz refresh rate technology creates clearer and smoother fast motion video; Expert Mode and ColorMaster calibration capability. <http://us.toshiba.com>

#### **Sharp reveals that 32-inch 4K IGZO monitor will offer full Mac OS X support**

Sharp has announced that its 32-inch 4K touch-screen monitor will have drivers that offer full Mac OS X support. While the monitor is designed primarily for use in retail and business, this could potentially open the door to touch-screen Ultra HD TVs being used in the home. Sharp predicts that OS X drivers for the TV will be available to download within the next one to two months. The monitor is 36mm thin, with a 3840x2160 pixel IGZO LCD panel, and has full stylus support. It includes a series of infrared sensors that help to detect the position of users' fingers with speed and precision. <http://sharp-world.com>



### Panasonic unveils Ultra HD smart TV



The Smart VIERA WT600 is the first 4K TV to offer 60 frames per second input based on the new HDMI 2.0 standard; this represents a significant step up from the 4K 24 FPS and 30fps limitations of the HDMI 1.4 standard. The Smart VIERA WT600's handles very well of 4K video streaming from YouTube. Aided by its built-in 4K H.264 decoder, the television is geared to take advantage of the emergence of high-definition Internet streaming video. It is equipped with a pop-up camera for video chats, the ability to play back 4K video files via an SD memory card or USB, and a 4K browser.

### Netflix CEO says 15 megapixels will be good enough to stream 4K

Netflix hasn't set a date for its anticipated launch of 4K streaming or previously indicated how much broadband speed consumers will need to obtain it, but CEO Reed Hastings dropped some hints on both counts in a video interview on September 13 with Claus Bülow Christensen, the producer of the Copenhagen Future of TV Conference, according to *Multichannel News*. While Hastings doesn't expect 4K TVs to fly off the shelves while prices remain high, he sees 4K video first taking hold on tablets, laptops and PCs as resolutions improve on those devices, helping to set in motion the adoption curve and, eventually, lower costs for 4K televisions. That thinking also seems to fit into why Netflix is keen on streaming video in this emerging format as it gets its hands on a library of 4K source material. "Going forward we'll see more and more 4K, and that will work really well over the Internet," he said. How much speed will consumers need? "It's around 15 megabits per second," Hastings said. "It's not too bad. If you've got a 50-megabit connection you'll be fine." Netflix has been using proprietary video encoding technology from eyeIO to keep the bandwidth requirements of its current streaming service in check, but hasn't announced if it will be using the vendor's technology to help it squeeze down the streams for its coming 4K library. Sony is using eyeIO's compression technology for its recently launched 4K video download service, but confirmed that the size of its 4K movie files will still be in the range of 45 gigabytes to 60 gigabytes. But even at 15 Mbps, Hastings doesn't believe ISPs should worry about 4K video streaming clogging up their networks. Given that it's likely that only a few people in a given neighborhood will be watching 4K video at a time, at least early on, "as an overall system load, it will grow quite slowly and steadily, giving people lots of time to build the infrastructure." <http://www.multichannel.com/distribution/sony-opens-its-over-top-4k-video-store/145260>

### NTT claims highest-level compression

Nippon Telegraph and Telephone says it has developed compression software with the world's highest-level compression performance that is fully compliant with the Main/Main10 profile of the next-generation "H.265/HEVC" (High Efficiency Video Coding) video coding standard. The H.265 technology will ease mobile data congestion, hold down network operator investment costs, provide users with higher definition content even on bandwidth-constrained networks, and promises to deliver high-quality video streaming over LTE lines, and 4K video streaming over IPTV and other next-gen video services. Acquiring the H.265 encoding technology from NTT, NTT Advanced Technology Corporation (NTT-AT) rolled out the RealFeel series HEVC software codec development kit "HEVC-1000 SDK" to domestic and global markets in August. It says with this development kit, engineers have access to the latest HEVC standard in developing applications that conform to the highest-level compression performance that is available. This will open the way to video streaming to smart phones and other mobile devices over LTE and other fast links, and to 4K video streaming. <http://www.ntt.co.jp>

### NanoTech Entertainment announces the opening of 4K Studios

NanoTech Entertainment announced the acquisition of a state of the art video production facility in San Francisco California, 4K Studios. 4K Studios will be focused on the creation of original content shot and mastered in 4K Ultra Hi-Definition as well as the conversion of existing media into 4K digital content. The studio operation will be overseen by NanoTech's LX Rudis. 4K Studios is being equipped with the resources required to be a world class production facility including multiple 4K UltraHD movie scanners, 4K digital cameras and multiple editing bays capable of production meeting the criteria for the next generation of videos. 4K Studios will work with content owners to provide 4K UltraHD conversions of their content as well as the ability to reach consumers with their



content through the upcoming NanoFlix UHD streaming 4K UltraHD channel. Headquartered in San Jose, California, NanoTech Entertainment is a technology company that focuses on all aspects of the entertainment industry. With five technology business units, focusing on 3D, gaming, media and IPTV, mobile apps, and manufacturing, the company has a diverse portfolio of products and technology. NanoTech Gaming Labs operates as a virtual manufacturer, developing its technology and games, and licensing them to third parties for manufacturing and distribution in order to keep its overhead extremely low and operations efficient in the new global manufacturing economy. NanoTech Media develops proprietary technology which it licenses to publishers for use in their products as well as creating and publishing unique content. NanoTech Media Technology includes the world's first 4K UltraHD streaming solution. NanoTech Communications develops and sells proprietary apps and technology in the mobile and consumer space. Clear Memories is the global leader in 3D ice carving and manufacturing technology. <http://www.NanoTechEnt.com>

#### **Upgraded Cineflex HiDEF offers 4K formats**

Cinematographers and directors can now leverage 4K, 6K and Super 35. General Dynamics Global Imaging Technologies announced that the upgraded Cineflex HiDEF stabilized camera system now has the option to be integrated with a Red Dragon or Arri Alexa XT M, in addition to the previously available Sony HDC-2500. Current Cineflex HiDEF owners also have the option to upgrade their legacy camera systems to the new design, including a complete system refresh to factory standards. The new Cineflex HiDEF represents the first 4K camera system available in the Cineflex family of products. The enhanced system design has a five-axis, gyro-stabilized assembly and incorporates fiber-optics to ensure compatibility with ultra-HD formats. <http://www.generaldynamics.com>

#### **TCL breaks \$1,000 threshold for Ultra HD TV**

China-based television manufacturer TCL (The Creative Life) launched a high-value 50-inch 4K edge-lit LED LCD model at an industry-low \$999 suggested retail price. The 50-inch UHD set, which was introduced along with a new flagship Full HD LED LCD TV line, shipped in September to directly go up against a 50-inch Seiki UHD model, which was introduced in April at a \$1,299 street price. TCL's model will also contend with 55 and 65-inch UHD TV introductions from Sony, Samsung, and LG. TCL's 50-inch Ultra HD LED TV offers 3840x2160 (4K) pixel resolution, built-in sound system with SRS TruSurroundHD technology, built-in up-scaling circuitry to present SD and HD content on full 4K screen, a 120Hz CMI (Clear Motion Index) refresh rate, and a 5,000,000:1 dynamic contrast ratio. It is equipped with four HDMI inputs, including one supporting the Mobile High-Definition Link (MHL) system for a tethered connection to smart devices. In addition to the 50-inch UHD set, TCL introduced its flagship 5510 Full HD 1080p LCD TV series, which includes the 40-inch (\$399), 46-inch (\$499) and 55-inch smart TV (\$799) screen sizes. The 40 and 46-inch 5510 models both offer 1080p resolution, 120Hz CMI refresh rate, LED edge lighting, a gun-metal-finish slim frame design and glass base. They offer a 3,500,000:1 dynamic contrast ratio, and three HDMI inputs including one with MHL support. The series' 55-inch smart TV offers 1080p resolution, 120Hz CMI, edge-lit LED display, and built-in Wi-Fi. The built-in smart TV platform supports service apps for Netflix, YouTube, Yahoo Apps and others. It also boosts the dynamic contrast ratio to 5,000,000:1. <http://www.tcl.com>



#### **Hispasat launches Ultra HD channel**

Spanish satellite operator Hispasat formally launched Hispasat 4K, a FTA TV channel that will be available for all the industry to perform tests and develop advanced solutions for new video formats. The first transmission was a 50 minute documentary on the Prado Museum, in Madrid, produced by TVE and co-produced by Hispasat. The new channel will be broadcast in MPEG-4 at a speed of 35Mbps, and, in experimental format, in the new High Efficiency Video Coding (HEVEC) format at a speed of 18Mbps. This will make the satellite transmission system the most efficient anywhere in the world at present. Content, coded in these formats, will be broadcast pursuant to the DVB-S2 standard by the Hispasat 1E satellite, offering coverage across Europe. It is also planned that transmissions will begin in North America and Latin America in the coming months. To carry out this project, Hispasat has partnered with Abertis Telecom, Thomson, TVE and LG. <http://www.hispasat.com>

### Korea's KT SkyLife Ultra HD set for 2014

South Korean satellite broadcaster KT SkyLife will commence test transmissions of 4K/Ultra HD programming next year, according to Seoul's Yonhap News Agency. Local cable operators are also planning test-streaming of 4K programming to a handful of subscribers in order to test systems. Korea Telecom's SkyLife DTH operation is working with Ericsson to handle what SkyLife described as "premium content", including Ultra-HDTV and HEVC-enabled material. SkyLife might start 4K transmissions with the FIFA World Cup. Japan's SkyPerfect has already confirmed it will be showing matches in 4K from Brazil. The NAB agreement covered the use of Ericsson's AVP and RX8200 equipment by KT SkyLife. <http://www.skylife.co.kr>

### Broadcom unveils new HEVC chipsets for Ultra HD subscriber hardware and content

With the newly released HEVC chipsets from Broadcom Corporation, operators and OEMs can now seamlessly release UltraHD subscriber hardware and content and support their objectives to realize increased footprint, higher resolution and additional channels, reports TMCnet. The new high efficiency video coding (HEVC) chipsets from Broadcom should help OEMs and operators to benefit from the falling Ultra HD TV prices and have access to more options for end-point delivery of Ultra HD/4K content. Broadcom's advanced Trellis set-top box multi-application software framework with secure hardware sandboxing should also help them add new services via intelligent system partitioning and management, the company says. Broadcom explained that the newly unveiled BCM7251 is a system-on-a-chip (SoC) for multi-HD/Ultra HD IP set-top boxes (STBs) that integrates the HEVC or H.265 standard, which enables more Ultra HD content. It also incorporates Dual Display, a feature that enables presentation of two simultaneous video channels from the same STB via independent HDMI outputs and remote control devices. <http://www.broadcom.com>

### Pesa offers new UHDTV routing switcher

PESA is introducing the Cheetah 4K 16x16 routing switcher and retrofit UHDTV/4K expansion kits for Cheetah 3 Gbps systems. Built on PESA's Cheetah digital video routing platform and utilizing the company's easyPORT converter module technology, the new 4K routing switcher provides UHDTV1 video distribution up to 600m for 2160p50/60, 10-bit 4:2:2 SDI signals. The retrofit kits provide a plug-and-play upgrade solution for current 3G-SDI Cheetah routers. At 4 RU, the Cheetah 4K 16x16 router provides the necessary control elements placed internal to the frame. With hot swappable matrix and I/O cards, as well as internal power and control, the need for additional power and external cabling is lessened, but redundant power and control modules can be added without additional rack space. The router is controlled through RS-232/422 or Ethernet connections, and its built-in SNMP MIB simplifies integration to third-party network system management software. Based on multi-link SDI transmission methods, each Cheetah I/O card includes four SC-style fiber CWDM connections carrying up to 12Gbps (4xSDI) for each input or output port. The 4K I/O card is a direct drop-in replacement for the standard 16-channel HD/3G SDI card found in current Cheetah frames. To complete the end-to-end 4K system, an outboard easyPORT module converts the signals from each CWDM port on the router back to conventional HD/3G-SDI video lines. For example, the Easy-4KX1F can transport four BNC inputs from a UHDTV source to the router via a single wire interface and switch the output via 4x fiber, 4x BNC or 1x CWDM fiber. The Easy-1FX4K module can extend four 3Gbps output signals over a single wire CWDM fiber up to 600m and convert back to BNCs. With the built-in crosspoint switch circuit on each easyPORT module, users can also send four independent SD/HD/3G-SDI signals over a single wire interface and can extend coax I/O an additional 80m using the built-in equalizing and reclocking circuits in each easyPORT module. Both UHDTV1 (3840x2160) and DCI 4K (4096x2160) are supported, and the router can mix and match between 4K CWDM and traditional copper or fiber I/O in the frame. The switchers can be rack mounted with an optional 1 RU frame that holds up to four media converters or can be installed with an optional under-the-table mounting plate.

Any Cheetah 3G-SDI switcher can be retrofitted with the Cheetah 4K I/O card system by replacing 16 channel I/O card set and reconfiguring the software to accept the 4K cards. Once the software is configured, the system can run 4K and 3G-SDI signals in parallel. Each easyPORT 4K media module includes Ethernet connectivity for control and configuration. The router can be configured and controlled via PESA's Cattrax network GUI or Cattrax Web network server software using PERC2000 or PERC3000 system controller hardware. <http://www.pesa.com>



### NanoTech Entertainment ships 4K UltraHD set top computer

NanoTech Entertainment announced that it has begun shipping its first 4K UltraHD set top computer, the Nuvola NP-H1. Pricing for the NP-H1 starts at \$699. Many commercial customers are now preparing to deploy trade show and other commercial displays showing off 4K UltraHD technology. With 4K TVs able to deliver a vibrant and natural picture that is four-times sharper than high definition, vendors need a robust solution to display content that can be used in an embedded environment, the company said. The NP-H1 is extremely flexible with a variety of I/O ports eSATA and USB connections that allow for the installation of an assortment of accessories, options and storage attachments. <http://www.NanoTechEnt.com>

### JVC and RGB Spectrum create 4K real-time multiviewer system

JVC Professional Products Company has partnered with RGB Spectrum to jointly develop a 4K real-time multiviewer system. The system combines JVC's PS-840UD Professional Series ProVérité or RS 840UD Reference Series 4K 84-inch LCD monitors with RGB Spectrum's SuperView 4K Multiviewer. The system is intended for custom installations in medical, simulation, command and control centers. The SuperView 4K is a real-time multiviewer designed for monitors with a native resolution of 3840x2160. Based on RGB Spectrum's real-time architecture, it can display and manipulate native 4K images, a combination of 4K and HD (1920x1080) windows, or up to eight HD graphic or video windows (scaled or unscaled) on a single 4K monitor. When combined with a JVC PS-840UD or RS 840UD, the result is an eight megapixel multiviewer with unprecedented multi-window clarity and resolution. Both JVC monitors feature an IPS LCD panel with 120Hz refresh rate and 10 bit color depth. Housed in a slim bezel with a 178 degree viewing angle, the ELED Illuminated monitors produce images from a variety of HD and 4K input sources, including HDMI 1.4a (single cable 4K up to 30p) and HDMI (four cable 4K up to 60p). The PS-840UD includes compatibility with the



Intel open pluggable specification, which makes it a high-performance choice for high-end public signage display applications. The RS-840UD has been licensed with the Imaging Science Foundation and includes a C3 mode for professional calibration. Settings are stored in the monitor for accurate reproduction of film or video content in a variety of viewing environments. <http://www.rgb.com>

### BSkyB claims first 4K TV satellite broadcast

UK pay television provider BSkyB successfully demonstrated what it claims was the world's first satellite broadcast done in 4K resolution. The event took place August 31 and featured coverage of a soccer game between two British teams, Stoke City and West Ham. The match was linked via satellite to BSkyB's main office and broadcasting facility located in Osterley (West London). The action was captured with four Sony F55 cameras and originated from an outside broadcast van specially equipped for UHD production. A 2160x3840 resolution was used, with images sent at 50 frames per second. Two UHD video file servers from EVS provided replays and graphics. Content was sent via a Eutelsat transponder, with Ericsson encoding/decoding gear providing four separate HD "tiles" that were used to construct the full 4K image at BSkyB headquarters. Viewing was done on a Sony 84-inch UHD television set. BSkyB officials made it clear that the transmission was intended only as a demonstration of technology in connection with sports broadcasts, not the launch of a new service. However, Sky Sports managing director Barney Francis did state that it proved that there is interest in UHD sporting events capture and may pave the way for future projects and services. "We saw enough in this test event to know that live sport in Ultra HD has real potential," said Francis. "The broadcast also demonstrated the capability of our satellite platform, which is ideally placed to continue supporting high-bandwidth video." The soccer match transmission followed an August 22 test of 4K image relay by satellite that involved UHD signals being sent from High Wycombe, a city located about 30 miles northwest of central London, to BSkyB's Osterley facility. SIS Live, a satellite transmission firm, coordinated that test, with the four video carriers muxed into a 140 Mbps stream and transmitted via a 72 MHz transponder on Eutelsat 3D. According to SIS Live, an additional test with the same

equipment configuration was performed on August 25. According to Francis, BSkyB plans to continue experimentation with UHD, noting that there was yet “much more to learn”. He added that as the organization continued with its UHD R&D work, it would also keep close tabs on penetration of 4K television receivers into the UK. <http://corporate.sky.com>

#### **Wilocity and DisplayLink allow wireless streaming of 4K video**

Two companies teamed up to demonstrate that even with that additional data, they were able to wirelessly stream 4K content from a laptop to a monitor, according to Computerworld. Wilocity, a developer of 60GHz multi-gigabit wireless chipsets, and DisplayLink, a provider of USB graphics technology, demonstrated Wireless Gigabit (WiGig)-enabled 4K graphics and video. The demonstration featured a Wilocity-powered WiGig integrated notebook and a WiGig docking station. The docking station also integrates the latest 4K-capable chipset from DisplayLink, which was connected to a 4K resolution monitor. A miniscule amount of 4K content has been made available to stream to new televisions. That's not for lack of content. Most movies, sporting events and even television shows are being filmed in 4K, they're just not being presented at the higher resolution. China-based TCL announced in July that it will sell a 4K resolution, 50-inch UHD TV starting this fall for \$999. Similarly, Samsung and Sony announced big price reductions for their 55-inch-plus Ultra HDTVs. For 65-inch 4K TVs, Samsung's asking price recently fell from \$7,500 to \$6,000, while Sony cut its price from \$7,000 to \$5,500. For 55-inch models, Samsung dropped the price from \$5,500 to \$4,500, and Sony's prices fell from \$5,000 to \$4,000. Wilocity's tri-band Wi-Fi technology enables users to stream the 4K content to displays, networks and other peripherals, and allows for future upgradeability to the newest video innovations, without tying the WiGig specification to a specific video resolution. WiGig also allows for highly directional connectivity, at rates up to 7Gbps in the 60GHz band, avoiding the interference and congestion that exists in the legacy 2.4GHz and 5GHz bands. The result is better wireless performance. <http://wilocity.com>

#### **Beamr Video delivers high definition video at low bandwidths**

Beamr Video, a next-generation, patented video optimization technology enabling smooth delivery of HD video at speed and quality levels debuted at IBC. The Beamr Video optimization technology automatically reduces the bitrate of any H.264 video stream by up to 50% without affecting perceptual quality or altering the format of the original stream. Representing a transformational trend in the broadcasting industry, Beamr Video is raising the bar on video quality and UX by overcoming bandwidth challenges present with many current infrastructure designs. Beamr Video significantly reduced bitrates to enable Internet content providers, network operators, on-demand video services and over-the-top (OTT) service providers to distribute exceptionally high quality video with faster downloads and smoother streaming on bandwidth constrained connections. Beamr Video produces fully compliant H.264 (MPEG-4 AVC) video streams and is device agnostic, making high quality video accessible from any media player, browser or consumer devices such as smart phones or tablets, without installing additional software. Currently undergoing extensive lab and field-testing by multiple major Hollywood studios, Beamr Video's patent-pending automated algorithms enable a high-quality streaming experience that ensures the maximum quality with the lowest bitrate. The recently proposed High Efficiency Video Coding (HEVC/H.265) standard promises up to 50% bitrate reduction compared to the existing H.264 standard, but it will take at least four to six years for mass-market penetration. Beamr Video says it is solving the bandwidth bottleneck now, offering the same reduction ratios for H.264 streams today as those promised by HEVC. More importantly, they can do so without forcing users to download any additional software or programs. <http://www.beamrvideo.com>

#### **4K displays go mainstream at US Micro Products**

US Micro Products has released a new line of LCDs with four times the resolution of traditional hi-res screens. US Micro Products has released an all new line of 4K displays. The panels are intended for design into OEM applications and are manufactured by Innolux Corporation. US Micro Products is piloting the 4K display line in 28, 39, 42, 50, 58 and 65-inch sizes. 4K is a type of LCD with roughly 4,000 by 2,000 pixels, four times the resolution of traditional 1080p high resolution televisions. Also known as UHD for Ultra High Definition, 4K panels offer a sharper, clearer picture for an extremely detailed and often hyper-realistic experience. Integrators primarily use UHD to achieve maximum impact on the viewer. The technology can also act as a crucial aid in scenarios where extra clarity is needed: for example, when evaluating a medical image like an MRI. Demand for higher resolution display options has risen sharply among OEMs, especially in the entertainment, medical, industrial, surveillance

and design markets, says US Micro Products. 4K may still be in the early phases of integration, but is certain to permeate a variety of industries in the near future, especially as content generation and conversion to UHD format catches up with technology. Many display experts predict that 4K will soon supersede 3D as the ultimate home theater experience. US Micro Products specializes in engineered display solutions. These displays are created specifically for individual applications by selecting the best combination of standard components or tooling a unique solution. The company also carries a wide range of standard display products, including TFTs, OLEDs, simple LCDs and touch panels, as well as peripheral products including trackballs, keyboards and printers. US Micro Products' customers are OEMs building diverse applications for use in the medical, gaming, industrial, automotive, defense, instrumentation and kiosk markets. US Micro Products has provided solutions to Lockheed Martin, Honeywell, Abbott Diabetes, Philips Medical, Siemens and GE Healthcare, among others. Display and human interface projects range from high volume consumer electronics to low volume custom projects. <http://www.usmicroproducts.com/displays/tft/4k>

#### **Vitec releases world's fastest HD H.264 IP streaming codec**

Redefining low-latency IPTV streaming, Vitec's MGW Sprint appliance encodes and decodes 1080p HD content enabling IP video delivery with no visible delay - matching the performance of uncompressed video. Vitec announced the official release of its new portable encoding/decoding appliance - MGW Sprint. The MGW Sprint is now available through Vitec's worldwide network of resellers and integration partners and was demonstrated live, with its TurboVideo2 technology for ultra-low-latency delivery of HD H.264 IP video. The MGW Sprint Encoder and MGW Sprint Decoder are a set of portable appliances with HDMI, DVI and HD-SDI inputs and outputs that stream unicast and multicast 4:2:2 and 4:2:0 video with an end-to-end delay of under one video frame. The compact units feature no moving parts, making it 100% silent, and produce excellent picture quality over IP. <http://www.vitecmm.com>

#### **Samsung announces world's largest 4K displays, 98-inch and 110-inch UHD TVs**

At CES in January, Samsung showed off an 85-inch 4K LED TV. For Berlin's IFA, the company has now made the European debut of a 98-inch S9 model and a 110-inch version. In related news, the company also announced 55-inch curved and flat format UHD OLED TVs, representing "an unprecedented leap forward for picture quality and sharp contrast with its self-emitting pixels and natural motion," the company says. <http://www.samsung.com/uk/#latest-home>

*Samsung's 110-inch UHD display*



#### **Anapass announces mass production of LCD panel controller for UHD television market**

Anapass, a display SoC solution provider, announced that it has successfully completed development of a leading-edge panel controller system on chip for UHD TV applications and has recently started mass production. As a result of the successful commercialization of a competitive panel controller SoC for UHD TV, Anapass will be well positioned as a leading panel controller provider for the rapidly growing next generation world-wide TV market, UHD TV, the company says. Anapass developed and commercialized its proprietary intra-panel interface technology for flat panel TV displays known as AiPi (Advanced Intra Panel Interface). By leveraging its technology, Anapass has been a major panel controller supplier for Samsung's flat panel TV display business and has been listed on the KOSDAQ since 2010. The company has made progress in developing innovative technology and IP necessary for highly integrated, high performance and feature-rich panel controller SoC products. This has resulted in the successful commercialization of a leading-edge panel controller SoC dedicated for the UHD TV application. According to a market research report produced by SNE Research in May 2013, the number of worldwide TV shipments forecasted for this year is 235.1M, 2.6M units of which are expected to be UHD TVs. This year is the first to show significant emergence of UHD TVs as the next generation TV. According to the report, between this year and 2016, the UHD TV market is expected to rapidly grow with 191% CAGR, therefore nearly doubling every year. The rapid growth of the UHD TV market is reflecting the recent market situation in which the world's leading flat panel TV makers are aggressively expanding their UHD TV line up from premium high-end TVs

down to high volume, smaller panel size TVs ranging from 50 to 60 inches. As such, the UHD TV market is expected to have very aggressive growth. In addition, the swift evolution of the UHD (3840x2160) video content eco-system, which provides four times higher resolution than FHD (1920x1080), is strongly supporting the emergence of the UHD TV market era. Anapass is currently developing mobile application processors for mid-low end 4G smart phones by collaborating with its partner company, GCT Semiconductor which is a leading 4G LTE mobile communication SoC solution provider. <http://www.anapass.com>

### **Panasonic unveils 65-inch 4K 60fps ultra-connected TV**

Panasonic unveiled the 65-inch VIERA WT600 TV. According to the company, it is “the first 4K Ultra HD TV in the world with a 4K 50/60p input designed based on HDMI 2.0 and DisplayPort 1.2a specifications.” Besides offering 4K resolution at up to 60fps, the metal-and-glass bodied WT600 also features 2,000Hz back light scanning, which provides high motion sharpness, even in fast action scenes. The image quality is further helped out by 4K “Intelligent Frame Creation” frame rate conversion technology; the ability to visually optimize each object in a scene independently, regardless of the direction of movement; a “virtually infinite contrast ratio”; local dimming pro circuit and the unique gamma area control, which together allow for more details to be visible in bright or dark areas of the overall picture; and, compatibility with CalMAN calibration software, which is designed for perfect color neutrality, according to Gizmag. The sub-4K video is boosted by the TV’s 4K “Hexa-Processing Engine”. This feature reproduces data missing from the lower-resolution signal, bringing it closer in quality to that of Ultra HD. It has its own built-in HTML5 web browser, allowing it to display 4K web pages. It also features an “industry-first” 4K H.264 (MPEG4) decoder, which lets it play back 4K video files via USB, SD card, or directly from the Internet. Individual users within the same household can access their own personalized pre-set Home Screens, which are

designed to provide “quick and easy” access to content from their favorite providers – both broadcast and Internet. It also has built-in LAN, which lets users access multimedia content from the TV throughout the house, on other devices. Additionally, its twin HD tuners allows users to record one program while watching another one live, or to view two programs at once – one on the TV, and one transmitted via LAN to a tablet or other device. Users can control the WT600 by voice. This is done through a microphone on the TV’s touchpad controller, or via the Panasonic TV Remote 2 App on a mobile device. <http://panasonic.net/>



*Yoshiyuki Miyabe and Markus Wagenseil unveil the VIERA WT600 at IFA 2013*

### **Sony sells 4K TV/media player with one year of Netflix and Hulu Plus**

Sony has opened the doors to Video Unlimited 4K, a video download service that will offer more than 100 titles in the Ultra HD format for rent or purchase by the end of the year. The service requires the Sony FMP-X1 4K Ultra HD Media Player, which sells for \$699.99 and is only compatible with Sony-made 4K sets. Sony is promoting several 4K TV/media player bundles, including a 65-inch set that comes with one year of Netflix and Hulu Plus for a \$5,999.98. A 55-inch Sony 4K TV with a similar bundle comes at \$4,599. The Sony 4K media player comes pre-loaded with 10 movies, including The Amazing Spider-Man, That's My Boy, Total Recall 2012, Taxi Driver and The Bridge on the River Kwai, and a collection of 4K video shorts. Sony said 24-hour 4K movie rentals start at \$7.99, with purchases starting at \$29.99. Sony estimates that the media player’s on-board 2 terabyte hard drive can fit about 45 full-length feature films. Sony is trying to keep bandwidth requirements in check using proprietary compression encoding technology developed by Eye IO, but the new 4K downloading service could wreak havoc on emerging usage-based broadband service policies that charge extra when customers exceed their monthly consumption limits. <http://www.sony.com>

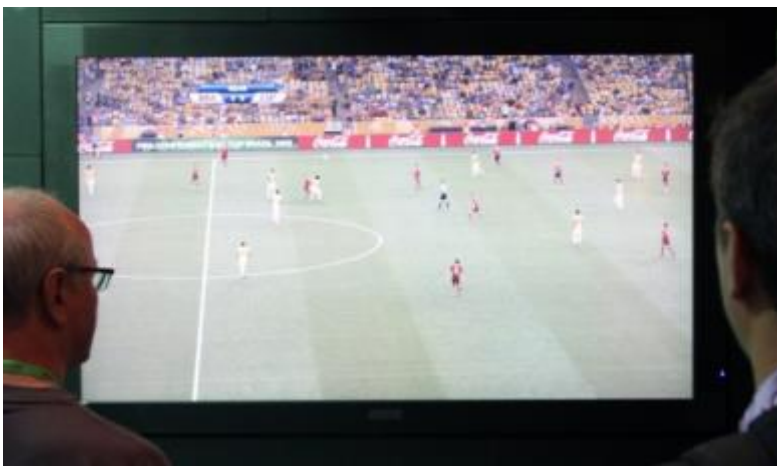
### **Sony leads in Ultra HD TV market in 1H13 says DisplaySearch**

Sony led rival brands to capture a 37.8% share of the global Ultra HD TV market in the first half of 2013, according to DisplaySearch. LG Electronics ranked second with a 14.2%, as Samsung Electronics took the seventh position with a 4% share. Powered by strong sales of its 55 and 65-inch models, Sony’s Ultra HD TV sales yielded

revenues of \$185 million in the first half compared to total global sales of US\$490 million in the segment, the data showed. Sony also plans to roll out mid-range 55 and 65-inch Ultra HD TVs in the second half of 2013, which could bring the prices of 55-inch models to \$4,000 and the 65-inch models to \$5,500, according to industry observers. To catch up with Sony, Samsung and LG both are expected to launch their own 55 and 65-inch Ultra HD TVs in late third quarter of 2013, with prices ranging \$4,500-6,000. But the race to win the fledging Ultra HD TV market is expected to become keener in 2014 as China-based TV vendors are sure to also enter the segment, flooding the market with an assortment of 39, 50, 55, and 65-inch models. Meanwhile, Sony's total LCD TV shipments are likely to reach 14 million units in 2013, compared to its revised target of 15 million units due to lower than expected demand in emerging market, according to the latest data compiled by DigiTimes Research. Sony shipped 13.5 million LCD TVs in 2012. Sony is expected to produce 45% of its LCD TVs in house in 2013, while outsourcing the remaining 55% to Taiwan-based OEMs, with the bulk of orders going to Foxconn Electronics and a small portion to Wistron, said DigiTimes Research.

### Japanese broadcaster looks beyond 4K to 8K

Although 4K was the story at IBC in Amsterdam again this year, as it has been for the past couple of years, Japan's national public broadcaster, NHK, was going one better with a demonstration of 8K, or Super Hi-Vision (SHV). The company's roadmap set a 2020 date to begin satellite broadcasts of 8K content, which aligns nicely with the Olympics recently being awarded to Tokyo for that year, says Gizmag. Rather than the 145-inch Panasonic plasma TV that was used at IFA last year, this year saw NHK demonstrating 8K (7680x4320) on an 85-inch Sharp LCD. The pictures were being supplied in MPEG-H HEVC/H-265 from what NHK says is the world's first real-time encoder to support the first standard capable of handling the 8K resolution and 60p frame rates of SHV. The SHV format also includes 22.2 multichannel surround sound that reproduces sound in three dimensions. Although NHK has been developing 8K technology since 1995, the Olympic games often provide a good opportunity for broadcasters to give new technology a help. After successfully transmitting a SHV signal over the air in 2012, it also shot the opening and closing ceremonies and a few events of the 2012 London Olympics in 8K and transmitted the pictures live via a high performance Internet network. Tokyo being awarded the rights for the 2020 games gives the broadcaster more than just an arbitrary date to aim for to make its first 8K satellite broadcasts a reality. NHK also displayed a couple of compact 8K cameras at IBC, including a portable camera system and a cube camera head. The portable camera system includes a 5.3kg (12lb) camera head, a 14kg (31lb) camera control unit (CCU) and captures 8K images with a 2.5-inch, 33-megapixel CMOS sensor. The 2kg (4lb) cube camera head measures 12.5x12.5x14cm (5x5x6 inches) and captures images with a 1.5-inch, 33-megapixel CMOS sensor. The portable camera system takes 35 mm full-frame lenses, with both cameras supporting PL, EF and F lens mounts. <http://www3.nhk.or.jp/nhkworld/english/news/index.html>



*NHK's 8K demonstration attracted a crowd at IBC 2013*

### World Cup could be 8K, 4K and 3D, according to FIFA

FIFA's host broadcast partner says both 8K and 4K are possible options for shooting next year's World Cup, while a 3D live production is also on the cards thanks to interest from China. While a full HD production dominates the schedule of FIFA's host broadcast partner HBS, speculation surrounds the broadcast of Ultra HD 4K from Brazil

next July. Francis Tellier, chief executive of FIFA's long-standing broadcast partner Host Broadcasting Services, suggests that not just 4K, but an 8K Ultra HD World Cup for 2014 is a possibility. Sony is talking with FIFA, and FIFA is talking with Japanese broadcaster NHK. Technically it is possible to send an 8K signal back to Japan over IP and then onto satellite so maybe they can do the final in 2014 in 8K, he said. HBS collaborated with Sony to produce three matches in 4K Ultra HD at FIFA's Confederation's Cup soccer tournament in Brazil in June, but stresses that the format's production is still experimental. At the same time in June, NHK were conducting their latest trial of 8K capture. But the production limitations are still huge. Roughly 3000 hours of HD content will be captured during the 2014 event, similar to World Cup South Africa 2010, and much more of this will be stored longer term rather than erased – a necessity in SA in order to free up server space. There will also be 40 ENG crews located in the Brazilian hinterland to deliver training camp action back to the International Broadcast Centre in Rio. <http://www.c2meworld.com/creation/world-cup-could-be-8k-4k-and-3d/#sthash.NuXh8KEx.dpuf>

#### **European satellite broadcasters demo live 4K contribution**

Ericsson, Eutelsat Communications, Globecast, Newtec and Sky Italia said they successfully live tested end-to-end satellite-based delivery chain for contribution of live images in 4K. The 4K feed was produced by Sky Italia in 3480x2160 at 60p using different camera brands and video mixers. The live sequences from the mixers were said to then be delivered in the form of a quadruple 3G-SDI signal to Ericsson's content acquisition platform. Using Ericsson AVP 2000 contribution encoders to provide 4K contribution feeds, the signal was compressed in MPEG-4 AVC at 60p and 10-bit, 4:2:2 resolution by the Thomson VIBE VS7000. The signal was then modulated by the Newtec AZ110 satellite modulator, using DVB-S2 16APSK modulation, making 89 Mbps of throughput available over a conventional 36MHz Ku transponder on board the Eutelsat 5 West A satellite located at 5° West. The satellite uplink was performed and monitored by Globecast from one of its HD SNG trucks, equipped with a 1.5-meter antenna and 400W amplifier. The feed was received in Milan and in Southampton with 2.4 meter antennas. Signal availability was higher than 99.97%, the companies said. The sequences were then received via four Ericsson RX8200 advanced modular rReceivers feeding a 4K professional display. <http://www.eutelsat.com>

#### **Toshiba launches high quality image processing IC for LCD TVs**

Toshiba Corporation announced the launch of "TC90232XBG", a high quality image processing IC for LCD TVs that supports the LVDS input and output for Full HD (1920x1080) and WXGA (1366x768). Mass production is scheduled to start in December this year. The IC's built-in super resolution circuit improves image detail, while an integrated noise reduction function analyzes and detects the edge and flat regions in the image, reducing random noise and mosquito noise, a digital compression artifact that appears near the image edge. A highlight enhancer function to emphasize brightness and brilliance, and an image quality tuning function for color management and gamma correction, are also integrated into the chip. TC90232XBG adds new functionality to LCD TVs and monitors. Key features of the product are Toshiba's original super resolution circuit improves image detail; built-in noise reduction function reduces random noise and mosquito noise; the highlight enhancer emphasizes image brightness and brilliance; color management and gamma correction realize proper image quality tuning for a wide range of LCD panels; the widely used I2C BUS control and LVDS standard facilitate easy upgrade of current designs; the IC supports LVDS input and output for Full HD (1920x1080) and WXGA (1366x768); small package: 13x13mm; external DDR memory is not required. <http://www.toshiba.co.jp/index.htm>

#### **Toshiba announces new TV strategy with introduction of new TVs**

Toshiba Corporation announced its new strategy for driving growth in ASEAN and underlined its commitment to the fast growing region with the launch of the Toshiba "Pro Theatre", a new line-up of LED TVs designed to provide viewers with a truly exciting viewing experience. Toshiba positions growth in the ASEAN economies as the cornerstone of its strategy. By providing a broad range of high-value products that are closely attuned to the demands and changing lifestyles of the ASEAN countries, Toshiba aims to achieve more than 20% market share in unit terms in this region by the end of fiscal year 2014. The Toshiba "Pro Theatre" line-up is the first step to achieve this goal. Toshiba will launch three new series of Pro Theatre in the ASEAN market: the flagship L9300 Series; the L4300 series, Toshiba's first TVs with the Android operating system; and the L3300 series featuring "Turbo LED" and "Detail Booster". All of the TVs in the "Pro Theatre" line-up feature "Intelligent Auto View", a new technology that monitors room brightness, and other aspects of the viewing environment. It then automatically adjusts picture parameters such as color temperature, color depth, sharpness, and backlight. Meticulous fine



tuning of these characteristics ensures that the “Pro Theatre” line-up delivers optimal movie quality at all times. This new technology is grounded in studies of the human brain-eye characteristics and on analysis of the picture parameters in the professional monitors used by film makers. Featuring four times the resolution of today’s 1080p full HD TVs, the L9300 series delivers the ultimate viewing experience for movies and TV shows. Powered by Toshiba’s proprietary CEVO 4K and equipped with a Quad core CPU, the L9300 series delivers the highest quality Ultra HD image processing, including “Resolution Restoration” to restore clean, near Ultra HD image quality from less than 4K content and “Surface Brilliance Enhancement” that brings images to life like never before, the company claims. With over eight million pixels on an Ultra HD display, the L9300 series allows viewers to sit closer to the screen than with a standard HD TV set without being distracted by the pixel structure. Not only that, Toshiba’s advanced image processing technologies enable viewers to enjoy pin-sharp images and read small text easily. With this flagship series, Toshiba expects to establish a strong presence in ASEAN’s high-end TV market. The L9300 series, available in 58 and 84-inch models, is scheduled to ship in the fourth quarter of 2013. Toshiba is also offering the L4300 series, its first “TV with Android”. It opens up access to the wide array of Android apps and offers a convenient way to browse and enjoy content. The L4300 series supports YouTube, and images from the video sharing website are reproduced clearer and smoother thanks to Toshiba’s image processing technology. The L4300 series, available in 39 and 50-inch models, is scheduled to ship in the fourth quarter of 2013. The L3300 series showcases two of Toshiba’s latest innovations in image processing: “Turbo LED” and “Detail Booster”. “Turbo LED” boosts brightness dramatically, by 50%, delivering clearer, smoother images with superb resolution. The feature is controlled by the viewer and can be used when needed, keeping power consumption to a reasonable level. “Detail Booster” enhances both resolution and image texture. It improves overall resolution by restoring image edge sharpness affected by the upscaling process, while texture enhancement analyses the original images and hones a stereoscopic effect by strengthening their brilliance. With brighter, cleaner pictures, it delivers greater viewing pleasure. The L3300 series also supports YouTube. The L3300 series, available in 32 and 39 inch models, is scheduled to ship in September 2013. <http://www.toshiba.co.jp>

#### **Cognitive Networks selected by LG Electronics to enable enhanced TV capabilities on smart TVs**

Cognitive Networks, a market leading provider of real-time data services that power enhanced TV on smart TVs, announced LG Electronics will be the first to integrate Cognitive Networks’ real-time data service on its smart TV platform, enabling a more robust “Enhanced TV” experience for consumers. Enhanced TV allows viewers to run applications that augment the TV viewing experience on smart TVs. The implementation of Cognitive Networks’ technology on LG smart TVs initiates a fundamental transformation of the way viewers consume TV, while delivering a platform for content producers and TV networks to increase viewer engagement and grow their audiences. Engage is a cloud-based data service that provides real-time event triggers to application providers. Powered by proprietary Automatic Content Recognition (ACR) technology, the triggers are accurate to the second and allow application providers to launch opt-in based applications on LG smart TVs used in the US, which are intelligently synchronized with live or time-shifted television. Consumers will have complete control of the apps they launch and access, ranging from ordering a pizza, responding live to opinion polls, interacting with reality shows in real time, and engaging with a variety of new social TV options based on today’s popular social media platforms – all using the intuitive LG Magic Remote. With Enhanced TV, content producers and TV networks can push deeper engagement for increased brand value by boosting viewership, watch time and new audiences, while advertisers will be able to pinpoint what viewer’s interests are and provide more targeted advertisements based on their preferences. <http://www.cognitivenetworks.com>

#### **MAXON announces availability of CINEMA 4D Release 15**

MAXON announced immediate availability of CINEMA 4D Release 15 (R15), a milestone release of its flagship 3D motion graphics, visual effects, painting, and rendering software application. Marked by new features and powerful 3D workflow enhancements to modeling, text creation, digital sculpting, advanced rendering optimization – including all-new network rendering capabilities – Release 15 expresses the company’s commitment to deliver its customer community with continued innovation and the most advanced 3D creative solutions in the industry. Ideally suited to broadcast motion graphics and visual effects artists, game developers, architects and designers seeking exceptional stability and performance, CINEMA 4D Release 15 offers spectacular image quality, unmatched integration with leading 2D compositing applications, and a straightforward, efficient and flexible interface to handle the complexities of today’s cross-collaboration production environments. Release 15 is

available for both Mac OS X and Windows. Recent high profile entertainment projects that have used CINEMA 4D for spectacular animation and visual effects sequences include a range of feature films including Pacific Rim, Iron Man 3, Oblivion, the hit game series Halo 4; the multi Emmy-award winning TV series Boardwalk Empire and Grimm; and countless broadcast campaigns, title sequences, music videos and television commercials for leading international brands. Acclaimed as the most pipeline-friendly professional 3D package for the motion graphics market, today's most widely recognized broadcast and television industry entities rely on CINEMA 4D including NBC, FOX, MTV, Comedy Central, NFL, National Geographic Channel, BBC, Swiss TV, Sky TV, Al Jazeera, and many others. <http://www.maxon.com>

#### **Analogix demonstrates Ultra HD 4K mobile solution**

Analogix Semiconductor launched the industry's first SlimPort ultra high-definition (Ultra-HD) transmitter solutions, which enable smart phones, tablets and other mobile devices to connect with TVs, projectors and computer monitors to display movies, presentations and other content in up to 4K resolution. Ultra-HD displays, the latest advance in video performance, offer a theater-quality viewing experience, with vertical resolution of nearly 4,000 pixels (3840 pixels x 2160 lines) – twice the resolution of today's popular 1080p HDTV displays. Demand for 4K products is increasing as chip makers add support for 4K output capability to their latest devices, such as Qualcomm's new Snapdragon 800 APQ8074 processors. Analogix's ANX781X transmitters, like others in its SlimPort line, are ultra-low power devices that work in conjunction with SlimPort receivers to convey portable devices' audio and video signals to external displays. SlimPort-enabled mobile devices can connect to a wide variety of projectors, TVs and monitors, including those with VGA and HDMI interfaces, using SlimPort cables and adaptors. Device samples will be available in Q4 2013. Analogix Semiconductor is the leading supplier of DisplayPort-compliant semiconductors and IP products used in notebooks, tablets and other mobile devices. The DisplayPort standard is an innovative, packetized digital interface for high-resolution video and audio that was developed by the Video Electronics Standards Association (VESA). Analogix SlimPort products are based on DisplayPort technology. <http://www.analogix.com>

#### **NEC expands digital signage portfolio with video wall bundles**

NEC Display Solutions of America has launched two video wall bundles designed for digital signage solutions. The 2x2 (X462UN-TMX4P) and 3x3 (X462UN-TMX9P) LCD TileMatrix Digital Video Walls leverage four and nine X462UN displays, respectively, with the full adjustment capabilities of the Peerless-AV pull-out mounts. This mounting system allows for installation with precise alignment and access for servicing the video walls. The 46-inch X462UN's ultra-narrow bezel allows for a screen-to-screen distance between two neighboring X462UN displays of only 7.3 millimeters. The X462UN-TMX4P and X462UN-TMX9P video wall bundles include the following features: professional-grade LCD panels, advanced thermal protection and sealed panel design; EdgeComp technology, designed to ensure consistent images across the video walls; TileMatrix technology, which allows for manipulation of a single picture to 2x2 or 3x3 formats; copy function, which allows the application of settings from one display to all others; full connectivity with DisplayPort, HDMI and DVI-D digital inputs, and Ethernet with automated email notifications for diagnostic purposes. <http://www.nec.com>



*X462UN-TMX4P; X462UN-TMX9P*

### ESPN has no plans for Ultra HD

Still hurting after having to close its 3D channel, sports broadcasting giant ESPN say it has no plans to produce a separate Ultra HD channel. CTO Chuck Pagano says that neither DirecTV nor Dish have asked ESPN to provide an Ultra HD feed. While analysts are happy forecasting a potential Ultra HD audience of 10 million homes around the world by 2016, and perhaps more, there is – as yet – a reluctance from broadcasters to announce their own plans. To date, Japan's SkyPerfectTV has promised a 2014 start to its 4K transmissions, while Korean broadcasters, such as KT SkyLife are talking about similar plans. TV Globo is enthusiastic about exploiting the 2014 football World Cup as well as Brazil's 2016 Olympic Games in 4K. In Europe, the BBC is producing content in 4K and Sky Deutschland is carrying out extensive tests on the technology. The French-backed 4EVER project is making considerable progress in streamlining 4K production and post-production, while Ericsson is moving ahead rapidly with its technology support for 4K transmission.

### Altima launches development kit for processing 4K/8K resolution and uncompressed video transmissions

Altima announced the release of a development kit for the evaluation and design of Altera mid-range Arria V GX FPGA devices. This kit is aimed at designers of broadcast and other video processing equipment, and will be available for purchase from mid-June 2013. The development kit features powerful processing through the adoption of TSMC's 28nm LP process, and flexibility with the Arria V GX FPGA. It is also outfitted with a high-speed, large density external memory, invaluable for intensive video processing. It is implemented with a platform containing various interfaces commonly used in broadcasting equipment such as SD-SDI/HD-SDI/3G-SDI and SATA. Lately in the broadcasting equipment market, there is a growing need to offer high-performance solutions to create next-gen content and content delivery devices. The emergence of digital broadcasting both in Japan and on a global scale necessitates upgrading image quality, scaling up to 4K/8K resolutions, and converging broadcasts with other communication technologies. Using this development kit enables users to incorporate various interfaces as well as perform an assortment of processing tasks on 4K/8K resolution and uncompressed video transmissions. This development kit can reduce not only time-to-market, but by building a platform that tailors specs for different destinations, the component cost of the final product is also reduced. In addition, the development kit contains high-performance analog ICs from Linear Technology Corp., and clock and timing ICs



from IDT Inc., (both carried by Altima) which work in concert with Altera's FPGA to provide a comprehensive technological and business solution to customers. Altima also plans to continue selling development kits for a diverse range of devices outside of the broadcasting category which require image processing, such as OA and industrial applications. This development kit will be rolled out globally through Macnica Group subsidiaries to North America, China, Taiwan, and ASEAN countries. <http://www.altima.co.jp>

*Broadcast development kit*

### Semtech partners with Ross Video to demonstrate 6G UHD-SDI solutions

Semtech Corporation, a leading supplier of analog and mixed-signal semiconductors, announced that it is working with Ross Video and has delivered UHD-SDI components so that the company can develop a UHD-SDI capable distribution amplifier. Semtech's 6G UHD-SDI components allow the industry to transport higher resolution formats - both UHDTV and 4k digital cinema. These parts provide twice the density and half the power with outstanding performance all at a substantially lower cost than competitive 3Gb/s multi-link solutions. <http://www.semtech.com/>

### QD Vision announces breakthrough QLED efficiency results

QD Vision, manufacturer of Color IQ optical components for LCD applications, announced breakthrough results on next generation quantum dot light emitting devices (QLEDs), which are currently in advanced development stage. QLEDs are a quantum dot-based light emitting technology, which in the future will be used in applications such as electronic displays and solid-state lighting. QD Vision's latest QLED performance results are currently published in the 21 April 2013 issue of *Nature Photonics*. In the article, QD Vision reports achieving 18% external quantum efficiency (EQE) which puts QLEDs near the fundamental efficiency limit of the technology. These results are two times higher efficiency than previously reported state-of-the-art efficiency of a QLED device. QD Vision's current and luminous power efficiency are better than the best evaporated OLED result of the same color coordinate, and significantly better than what solution-processed OLEDs have thus far achieved. While at an earlier stage of

development and commercialization than QD Vision's Color IQ products, QLED performance is already suitable for use in certain products that require precision color solutions in an ultra-slim form factor, including monochrome visible and infrared displays, and lighting devices for machine and night vision applications. QD Vision's recent breakthrough QLED efficiency result, as well as the recent launch of the Color IQ optical component demonstrates the potential of quantum dots to be the most compelling light emitting material today and for next generation displays. <http://www.qdvision.com>

#### **Aptina combines DSLR picture quality and 4K digital cinema video in ultra-high speed camera sensor**

Aptina announced a new 14-megapixel CMOS image sensor for digital cameras, the AR1411HS, providing a unique imaging solution in the increasingly popular 1-inch format. By merging spectacular image quality with extremely fast frame rates, Aptina is enabling top consumer camera makers to develop the next generation of mirrorless, bridge, high-end compact, and broadcast digital video cameras. This sensor, which has attracted great interest from market-leading mirrorless camera makers, extends Aptina's high-performance camera sensor product line that was introduced with the 10 MP AR1011HS in 2012. The AR1411HS image sensor competes at the highest level with an ultra-sensitive pixel, using Aptina DR-Pix technology to achieve superior image quality in both low-lit and brightly-lit scenes. This is combined with the ability to output the full 14MP resolution at up to 80 frames per second (fps) for a 1.1 gigapixels/sec, 40% faster than its 10MP predecessor. The high-speed readout gives the sensor the capability of providing full 4K video at 60fps, in either the Quad HD (3840x2160) or the wider Digital Cinema 4K format (4096x2160), and a fast 120fps 1080p video mode, enabling slow-motion video capture without loss of resolution. This speed also gives the user the unique capability of grabbing full 14MP resolution still images without interrupting a super-sharp, oversampled 1080p HD video stream. <http://www.aplina.com>

#### **FutureVideo announces DVR to simultaneously record four Full HD camera feeds in H.264 format**

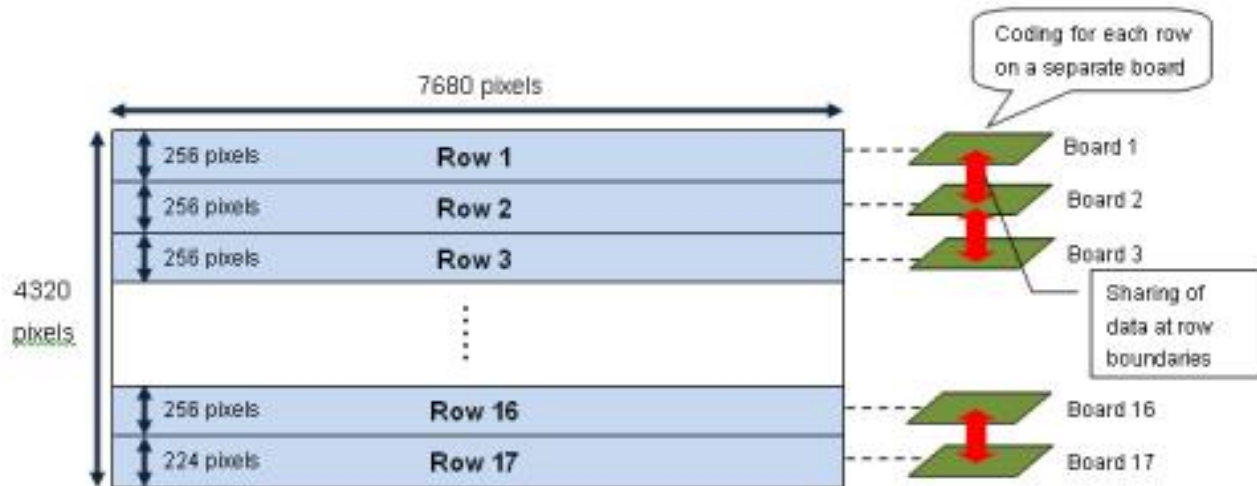
FutureVideo Products announced availability of its V-Station HD Field Multi-track Project DVR, which records four simultaneous tracks of full HD 1080p at 60fps video in H.264 format with a 30Mbps video rate. No other HD DVR has V-Station HD Field's recording capability and built-in project management system. It shifts the paradigm of video production work-flow by organizing all the metadata and video content at the start of production, instead of manually doing these tasks during post-production. Users operate V-Station HD Field via a 7-inch touch-screen color LCD panel (included). They can playback and review videos while new content is being recorded. V-Station HD Field's four-track DVR unit's dual hot-swappable 1TB Raid HDDs hold approximately 80 hours of 1920x1080p 60fps full HD video when four cameras are simultaneously being recorded. This provides redundant backup in case of a drive failure during recording. To facilitate smooth and efficient workflow once recording is completed, V-Station HD Field generates playlists, shot lists, and event logs that are easily transferrable to a V-Station HD Studio system for post processing. The Microsoft Excel compatible shot list file contains all the production metadata including each clip's camera information, project recording settings, file name, and date/time. <http://futurevideo.tv/>



#### **NHK and Mitsubishi Electric develop world's first HEVC encoder for 8K "Super Hi-Vision"**

NHK and Mitsubishi Electric Corporation have jointly developed the world's first HEVC encoder for 8K ultra HDTV "Super Hi-Vision". SHV is the broadcasting medium of the near future. It makes viewers feel like they are really at the heart of the action, with 16 times the number of HD pixels and a 22.2 multichannel surround sound experience. HEVC is due to be recognized as an international standard this year. It offers about double the data compression of AVC, and about four times that of the MPEG-2 standard currently employed for digital HDTV broadcasting. The high-volume SHV images are divided into 17 horizontal rows. The parallel processing of these rows makes it possible to achieve real-time coding of SHV images. The deterioration of picture quality at the row boundaries has been lessened by having rows share data concerning the speed, direction, etc. of moving objects. (see figure). NHK and Mitsubishi Electric Corporation are pursuing research and development of real-time coding of the 120Hz frame frequency of SHV. Video coding technology divides a frame into small blocks referred to as macroblocks. The prediction and transformation coding of the images is conducted in each block. HEVC offers variable blocks

that can handle up to 64x64 pixels, changing the size according to texture, while AVC has relied on a fixed macroblock size of 16x16 pixels. It achieves both high compression and high resolution. The SHV screen is divided in 17 rows made up of 7,680x256 pixels. The coding in each of the rows is processed simultaneously. Data in each row is shared with the row immediately above and below, thereby lessening the deterioration in picture quality that occurs at the row boundaries.



*Schematic diagram of parallel processing in the prototype HEVC encoder*

### **Mindspeed introduces interface solutions for 4K UHD TV**

Mindspeed Technologies, a leading supplier of semiconductor solutions for broadcast video infrastructure, demonstrated its new 6G-serial digital interface (SDI) video solutions for 4K ultra high-definition (UHD) broadcast video transport applications. Mindspeed's new Ultra-SDI products include the M22554, 6G-SDI adaptive video cable equalizer and the M22468, 6G-SDI video cable driver that support 6G/3G/HD/SD applications at 143 Mbps to 5.94 Gbps data rates. These new devices enhance next-generation system designs by providing higher density, lower power and lower material cost for transporting high quality UHD images compared to multi-lane solutions. The M21167 is a 6.5Gbps non-blocking 160x160 crosspoint switch that integrates input equalization and output de-emphasis with industry leading power consumption. The M22554 equalizer is a high-speed, lower-power, adaptive co-axial cable equalizer designed to increase the maximum distance of SDI video signals and DVB-ASI across commonly used bandwidth-limiting 75 ohm coaxial cable. The M22554 is designed to support data rates from 143 Mbps to 5.94 Gbps. The low noise, high-gain equalizer allows for low jitter 5.94 Gbps transmissions with dual differential outputs featuring programmable swing as well as de-emphasis. The equalizer operates using a single 2.5V supply voltage, provides advanced diagnostics capabilities including cable length indication, loss of signal detection and offers power management capabilities. The M22554 is housed in a 5x5mm 32-pin quad-flat no leads (QFN) package. The equalizer will also be available in industry standard 16-pin and 24-pin versions in a 4x4mm QFN package. The cable driver is optimized for performance from 143 Mbps up to 5.94 Gbps and is packaged in a 3x3mm QFN. <http://www.mindspeed.com>

### **Multiple new Gefen ToolBox splitters support ultra HD resolutions to 4K**

Just in time for the arrival of new 4K displays, Gefen is releasing three new Ultra HD splitters for HDMI with the ability to send 4K video resolutions to multiple 4K displays at the same time. Three Gefen ToolBox Ultra HD splitters for HDMI 4K/2K provide a one input to two outputs (1:2), one input to four outputs (1:4) and one input to eight outputs (1:8) distribution system. Resolutions up to 4K are delivered to all connected 4K displays. Each splitter comes in a wall-mountable enclosure in a black or white finish for a convenient installation near the source or behind the connected displays. All three Ultra HD splitters utilize Gefen's fast switching technology (FST), which vastly improves the HDCP authentication process. FST eliminates any video loss when powering on/off displays in the same distributed system. HDCP and 3DTV pass-through are fully supported. Digital audio formats including Dolby TrueHD, Dolby Digital Plus, and DTS-HD Master Audio are passed through along with video. All three Ultra HD splitters connect using standard, high speed HDMI cabling. Locking power supplies ensure uninterrupted performance. [http://www.gefen.com/kvm/gtb-hd4k2k-148.jsp?prod\\_id=11449](http://www.gefen.com/kvm/gtb-hd4k2k-148.jsp?prod_id=11449)

### Sony announces 4K TV pricing and intros 4K media player

Sony Electronics announced prices and availability for its new 4K Ultra High Definition TV sets unveiled at CES in January. The new XBR-55X900A (55-inch) and XBR-65X900A (65-inch) 4K Ultra HD LED TVs will cost \$4,999 and \$6,999 respectively. Sony is also announcing its 4K Media Player, the FMP-X1, and video distribution service – both industry firsts. This summer, consumers of Sony's 4K UHD TVs can purchase the FMP-X1 4K Media Player bundled with 10 feature films and video shorts in true 4K resolution for \$699. In the fall of 2013, users of the same 4K Media Player will be given access to a fee-based video distribution service offering a library of 4K titles from Sony and other notable production houses. The feature films included with purchase of the 4K Media Player are Bad Teacher, Battle: Los Angeles, The Bridge on the River Kwai, The Karate Kid (2010), Salt, Taxi Driver, That's My Boy, The Amazing Spider-Man, The Other Guys and Total Recall (2012). <https://blog.sony.com>



*Sony has announced the pricing for its 55 and 65-inch 4K TVs; Sony's 4K FMP-X1 4K media player*

### Russia's Tricolor testing Ultra HD

Russian pay-TV operator Tricolor TV is planning to test-broadcast using Ultra-HD technology, according to press agency Tass. Ultra-HD offers high-resolution 3840 x 2160 pixels, and the Tass report says that Tricolor will use a transponder on Eutelsat 36A craft, and transmitting in MPEG4 at 40Mb/s. Test material, comprising a 14-minute movie shot by Russia Travel Guide, will make the event what is claimed to be the first U-HD transmission in Russia. Tricolor is Russia's largest pay-TV platform and has been on air since 2005. It claimed 12.4 million subscribers as of March 25th this year. It is owned by media and industrial conglomerate Gazprom with Russian investment company VTB Capital owing a minority stake.

### Sony's rumored new Android phone captures 4K video for Ultra HD TVs

Ultra HD TVs are just hitting the market but Sony appears to be wasting no time in bringing 4x the resolution of an HDTV in a smart-phone camera. Leaked software suggests a Sony phone with 20-megapixel sensor is in the works, according to the Xperia Blog which found system software for the phone, code-named "Honami", showing the video capability which will reportedly powered by Qualcomm's Snapdragon 800 chip. This type of high-resolution camera capture may sound unlikely in a handset, but the Snapdragon 800 is Qualcomm's top-of-the-line silicon for smart phones. Specifications of the chip show it able to handle not just 4K UltraHD video but also stereoscopic 3D images and stills up to 55 megapixels. The leaked software for the Sony Honami indicates a 20-megapixel sensor for 5,248 x 3,936 resolution stills. Images from the reported Sony phone suggest a revamp of the company's Android-based software as well. The Xperia Blog says the phone will have a new launcher, app tray, Walkman app and new apps for clock, album, conversations, phonebook, settings, calendar. A new version of Small Apps allows you to place multiple apps in the screen at once.



### Marseille Networks' video processor launches into first consumer electronics products

Marseille Networks announced that their VTV-1222 video processor is in production and has been selected by major consumer electronics manufacturers. As the first video processing & up-scaling technology to achieve Technicolor 4K Image Certification, consumers can be assured that Blu-ray and streaming media products

branded Technicolor 4K Image Certified incorporate Marseille's UVD (Ultra Visual Detail) video processors. Marseille's breakthrough UVD video processing and up-scaling technology transforms the consumers existing standard HD content into an immersive 4K visual experience on their 4K TV. Consumers will be able to enjoy a 4K experience while preserving their current content library without having to wait for 4K content. Marseille's VTV-122x family of video processors are high-performance for 4K, 1080, and 3D applications, and meet the rigorous standards of Technicolor's "4K Image Certified" test suite. The family includes the VTV 1221, 1222 and 1223. The processors up-convert standard-definition and high-definition 2D video to 4K-resolution and also up-convert 3D video from HDMI source devices for viewing on 4K displays. The VTV-122X family-of-devices is HDMI certified to ensure interoperability and compatibility with the widest possible range of A/V sources and TVs. The VTV-122x family delivers pristine and sharp video output thanks to its UVD engine that incorporates a collection of state-of-the-art advanced algorithms in video, graphics, and image processing that work together to bring incredibly life-like image details to the TV screen. Detail enhancement brings out details in images and is especially useful when scaling video to higher resolution and when processing blurry content. Marseille's contextual detail enhancement automatically adapts to the type of content to bring the best of detail enhancement without the bad. Contextual edge restoration smooths overly coarse and jagged edges in video images. Marseille's advanced mathematics accurately analyzes objects, their edges and the overall context to adapt, on a per pixel basis, the processing to soften overly coarse and jagged edges without introducing blur or other undesirable side effects. Noise reduction reduces undesirable noise in video images. Noise is usually present in video content of poor quality and is typically introduced at the time of capture (e.g. sensor noise) or at the time of compression (e.g. block noise). Video up-scaling increases the number of pixels of both digital video and still images to either increase the pixel density for a given display size, increase the display size for a given pixel density or a mix of both. Marseille's scaler presents all the attributes of a modern ultra-high definition scaler to guarantee 10-bit precision throughout and treating chrominance with the same level of quality as the luminance. <http://www.marseilleinc.com>

#### **4K ultra-high definition TVs set to become new standard reports IHS**

A few years ago, stereo 3DTV came onto the market with tremendous hype and promise to transform how people watch TV. In business terms, it did not work. Faced with a lack of content, high pricing and inconvenient technology, 3D never emerged from a niche status – a situation that continues today. Many now predict the same fate for ultra-high-definition (UHD) television. Brands also learned they could not charge a price premium for S3D. This changed the adoption rate, and by the end of 2012, only about 20% of all LCD TVs sold had 3D capability, according to the LCD TV panel estimations from information and analytics provider IHS. Having learned from past mistakes, TV suppliers are gearing up to make UHD TV a success, determined not to repeat the mistakes they made with 3D. According to IHS, the current outlook shows suppliers shipping some 20.8 million UHD TV panels by 2017. The rise will begin this year as UHD TV panel shipments increase to close to 943,000 units, up from under 33,000 units in 2012. The next two years will see shipments rise to 7.1 million units in 2015, on their way to reaching 20.8 million units by 2017, with 50-inch and larger sets capturing 34% of the LCD TV panel market.

The market for 3DTVs faced three major obstacles when it launched: content, price and technology. Even with 3D popular in cinema with movies such as "Avatar", there was simply not enough 3D content for televisions. S3D TV also doubled the price premium of regular sets, and in perhaps the most significant obstacle of all, required consumers to change their viewing behavior by wearing a pair of glasses. For all these reasons, 3D adoption stalled. Many believe that UHD will suffer a similar fate because like S3D, the format lacks television content, and introductory prices are very high. Still, there are some major differences. UHD TV does not require any change in consumer behavior, as there is no need to wear glasses. UHD TV also provides greater depth to picture quality, giving a more immersive experience. And with upscaling technology, consumers can see better picture quality even when watching FHD content. Already, Japan has plans to begin UHD broadcasting as soon as 2014, two years earlier than originally planned. Also, 4K cameras and camcorders are now on the market, enabling creation of 4K content. Movies in 4K are likewise starting to show up.

The increased focus on UHD LCD TVs comes in part from delays in commercialization for OLED TVs, a technology that has encountered challenges in manufacturing. With UHD now taking over for the meantime, panel suppliers and brands are working aggressively to reduce prices, with lower-cost UHD TV sets expected later this year, mostly in sizes from 50 to 100 inches. Availability of low-end UHD LCD TV panels from suppliers, especially from Taiwan, may also help trigger UHD market growth, particularly in China. Some brands are already planning

to introduce a 50-inch UHD TV in China at a \$2000 price point. Along with lower prices, UHD TV quality also has to be accepted by consumers. For long term sustainable growth to occur, however, the quality of UHD TV must be deemed acceptable by consumers to justify the switch, and prices have to come down as well. Top panel suppliers such as Samsung, LG Display, AUO and Innolux are all introducing UHD TV panels, with brand manufacturers such as Sony, Sharp, Samsung, LG Electronics, Vizio and many Chinese brands planning to launch their own offerings later this year. The variety of products available, as well as the different price points and sizes for the sets, will help increase adoption rates, IHS believes. On the technological front, oxide TFT is considered to be a superior technology compared to conventional amorphous TFT LCD in order to achieve higher-resolution products. But oxide TFT faces challenges in capacity and yield issues, whereas panel suppliers have been able to offer lower-cost UHD panels produced from conventional amorphous TFT LCD. <http://www.ihs.com>

### **Sharp unveils THX-certified, 70-inch Ultra HD television**

Sharp unveiled a new flagship for its AQUOS line of televisions – the 70-inch AQUOS Ultra HD LED TV. Boasting four times the pixel resolution of high definition displays, the new model makes use of its dual core processor to optimize the original picture quality which is then interpolated and upscaled to a "4K-like" 3840x2160 image. The TV's four HDMI inputs accept native 4K signals and there's also an SD-card reader and two USB ports built-in. Active 3D is on board and two Bluetooth 3D glasses are included in the purchase. The design is marked by a thin, metallic black frame and a 35W, "in-front" six-speaker configuration that reduces the TV's footprint to that of a 65-inch screen. The new LED also gets the latest version of Sharp's Internet-connected SmartCentral platform, which enables a split-screen web browsing/TV watching experience. Android and iOS devices can be used to control the TV using the company's remote control app and content from these devices can be shared on the big screen via built-in Wi-Fi. When you are not watching TV, wallpaper mode can be used to turn the TV into a 70-inch picture frame. The other key selling point is a world first THX 4K certification. The AQUOS Ultra HD LED TV is due to ship in the US in mid-August at a price of \$8,000. <http://www.sharp.com>



*Sharp's 70-inch AQUOS Ultra HD LED TV*

### **Seiki shows off 4K TVs**

Seiki has demonstrated low-cost 4K TVs. To explain the low prices, the company says that Seiki's parent company, Tongfang Global, is the TV manufacturer, and they do a lot of the OEM work. The same company makes all components of the TV, with the exception of the glass, which allows them to take advantage of economies of scale. Seiki unveiled a new 39-inch model, retailing for \$699, to go with the 50-inch model that came out in April. A 65-inch model is expected by year's end. The smaller model is being marketed to gamers and PC users in addition to the living room buyer. <http://www.seiki.com>

### **Planar brings precision multi-touch to 4K displays**

Planar Systems announced that it is adding multi-touch, multi-user capabilities to its Planar UltraRes Series 4K LCD display product line. The addition of touch technology to the Planar UltraRes Series line of 4K displays combines a multi-touch experience with stunning 4K image clarity. It offers a solution for professionals who seek to collaborate or annotate using a large viewing area, high image resolution and enterprise-level features. It is also designed for public display applications such as way-finding, product catalogs and any interactive digital signage designed to promote customer engagement. Planar UltraRes Touch offers the following features: a multi-touch, multi-user experience. Planar UltraRes Touch offers six simultaneous touch points, allowing multiple users to collaborate and interact at the same time. The display recognizes the full range of common touch gestures including tapping, scrolling, pinching and rotating. The large 84-inch size lends itself to multiple users. With a native 4K resolution of 3840x2160, Planar UltraRes Touch provides four times the resolution of a full HD display. Touch brings viewers closer to the display and Planar UltraRes Touch delivers sharp clarity even at these close viewing distances. Planar UltraRes Touch supports both landscape and portrait orientations, providing the flexibility needed for a wide range of applications, all at a display size which mimics the human scale. Planar UltraRes Touch provides a sleek design for both function and style. It has a logo-free metal bezel and a range of



digital connectivity options. Using the Planar Profile mount, it installs less than 4 inches from the wall, making it compliant with the Americans with Disabilities Act (ADA). The Planar UltraRes Touch is available in three versions designed to suit the range of touch applications. Planar UltraRes Touch LX offers six simultaneous touch points and 350-nit brightness, making it useful for meeting rooms and control rooms for whiteboard, collaboration, video conferencing and presentation applications. Planar UltraRes Touch MX provides six simultaneous touch points, 500-nit brightness, and both landscape and portrait modes, a version for public venue and higher ambient light environments for branding, advertising and interactive digital signage applications. Planar UltraRes Touch 3D includes six simultaneous touch points, 420-nit brightness, and 2D and 3D viewing. It's a model for customers who work with 3D and 2D visual information for big data analysis, simulation and a range of uses in the design industry.

### **AOC cuts prices of cinematic 29-inch UltraWide display**

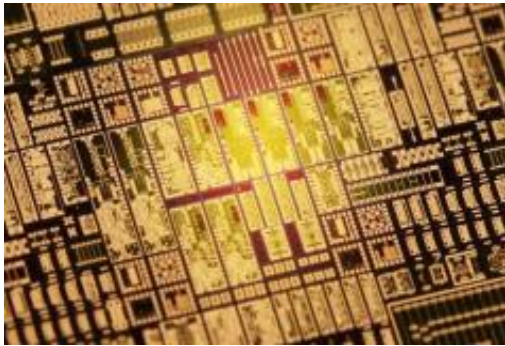
AOC announced a limited time special promotion on the Q2963PM, a 29-inch 21:9 super wide screen HD monitor that combines IPS LED technology with convenient connectivity to provide a cinematic display experience. The monitor has been available at Best Buy, Newegg and TigerDirect, among other retailers, for \$399, which is \$100 off the MSRP and up to \$300 less than competitive displays. The Q2963PM is equipped with dual 3W enclosed speakers and WFHD 2560x1080 resolution to deliver a more immersive experience. With multiple inputs like DisplayPort, HDMI and DVI, the display will also enable you to multiply your screen with Picture-in-Picture and Picture-by-Picture capabilities. This means you can watch a movie through a connected Blu-ray player on one half of the screen and browse the Internet through a connected laptop on the other half, and more. MHL technology will also allow to mirror a smart phone on the monitor's 29-inch wide screen. The panoramic Q2963PM display offers a 21:9 aspect ratio, which allows widescreen movies to be viewed without black bars on the top and bottom of the screen. The monitor's IPS panel also provides crisp and clear viewing from almost any angle. The Q2963PM features a dynamic contrast ratio of 50,000,000:1 from viewing angles up to 178° both vertically and horizontally. Combined with 250cd/m<sup>2</sup> brightness and a response time of 5ms, the display is ideal for both cinema enthusiasts and office users, the company says. AOC's Screen+ software allows the Q2963PM's vast screen to be split into individual work areas, making it easy to multitask and view multiple documents simultaneously. The extra desktop real estate is perfect for comparing documents side by side or using multiple program windows. In the office, the monitor's built-in speakers will also help to reduce cable clutter, as no external audio set-up is required. The display is also 100mm VESA compatible so that it can be mounted to the wall to save space and create a streamlined look. The Q2963PM offers multiple connections so that Blu-ray players, computers and other signal sources can be connected simultaneously and displayed at a high resolution of 2560x1080 pixels. Additionally, an integrated MHL port allows Android users to connect compatible phones and tablets directly to the monitor to mirror content to the 29-inch UltraWide display while charging the mobile device at the same time. <http://us.aoc.com>



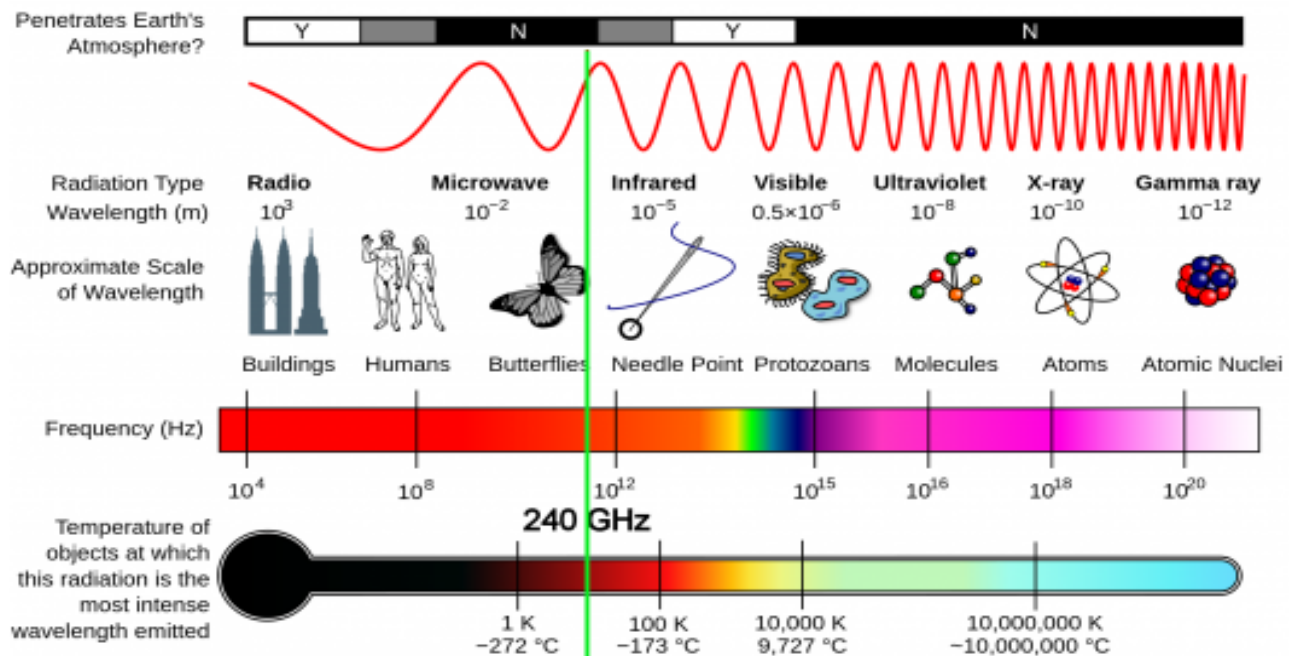
### **Fraunhofer records 40Gbit/s wireless data transmission rate with optical fiber**

Researchers of the Fraunhofer Institute for Applied Solid State Physics and the Karlsruhe Institute for Technology have achieved the wireless transmission of 40Gbit/s at 240GHz over a distance of one kilometer. Their most recent demonstration sets a new world record and ties in seamlessly with the capacity of optical fiber transmission. In the future, such radio links will be able to close gaps in providing broadband Internet by supplementing the network in rural areas and places which are difficult to access. Digital, mobile and networked – changing media usage habits of modern society require the faster transmission of increasing volumes of data. Compared to the European standard, Germany lags behind in the expansion of the fiber-optic network, according to statistics from the FTTH Council Europe. Deploying new fiber-optic cables is expensive and difficult when there are natural or urban obstacles such as rivers or traffic junctions. Broadband radio links can help to overcome such critical areas, thereby facilitating the expansion of the network infrastructures. In rural areas they can be a cost-effective and flexible alternative to “Fiber to the Home”. Researchers have now set a new world record in wireless data transmission. For the first time, fully integrated electronic transmitters and receivers have been developed for a frequency of 240GHz, which allows the transmission of data rates of up to 40Gbit/s. This equals the transmission

of a complete DVD in under a second or 2400 DSL16000 Internet connections. Distances of over one kilometer have already been covered by using a long range demonstrator, which the Karlsruhe Institute of Technology set up between two skyscrapers as part of the project "Millilink". Using the high frequency range between 200 and 280GHz not only enables the fast transmission of large volumes of data, but also results in very compact technical assembly. Since the size of electronic circuits and antennae scales with frequency/wavelength, the transmitter and receiver chip only measures 4x1.5mm. The semi-conductor technology developed at Fraunhofer IAF, based on transistors with high carrier mobility (HEMT), makes it possible to use the frequency between 200 and 280GHz with active transmitters and receivers in the form of compact, integrated circuits. The atmosphere shows low attenuation in this frequency range, which enables broadband directional radio links. Up to now, radio links were not able to directly transmit the data rates of glass fiber. This might change in the future, as the test setup of the project shows. Such a high performance system would also have the advantage of the so-called bit transparency, i.e. the signal of a glass fiber could be fed directly and without energy-consuming transcoding into a radio link. It could then be transmitted and redirected into a glass fiber. [http://www.kit.edu/visit/pi\\_2013\\_12950.php](http://www.kit.edu/visit/pi_2013_12950.php)



Micrograph of the 240GHz transceiver chip, which measures only 1.5x4mm



The lower end of the mm-wave frequency band is already being used for various forms of large-scale data transmission, with the 60GHz band now becoming active for Wi-Fi and other consumer data transmission applications

**Eutelsat 3D goes into full commercial service at 3° East**

The Eutelsat 3D satellite of Eutelsat Communications went into full commercial service at 3° East with all traffic transferred overnight from Eutelsat 3C onto the new satellite. With 33 operational transponders (32 Ku-band transponders of which 15 are 72MHz and one 108MHz Ka-band transponder), additional capacity is now available from 3° East to address video, data, telecom and broadband markets in Europe and also in Africa through a new service area. Eutelsat 3D will operate at 3° East until the deployment of the Eutelsat 3B satellite to this position in second quarter 2014 to provide further spectrum growth and high levels of operational flexibility in C, Ku and Ka bands. The entry into service of Eutelsat 3D enables Eutelsat to initiate enhancements to its fleet that will bring higher in-orbit security and increased capacity. Eutelsat 3C was deployed in early July from 3° East to the Hot Bird position at 13° East. Renamed Hot Bird 13D, it was co-located with the identical Hot Bird 13B and C satellites.

With each bird equipped with 64 high-power Ku-band transponders, they together span the range of 102 Ku-band frequencies at 13° East and will deliver 100 percent in-orbit redundancy. The reconfiguration of the Hot Bird constellation will release the Hot Bird 13A satellite which will be deployed to 7/8° West. Renamed Eutelsat 8 West C, it will enable Eutelsat to switch on additional transponders at the key neighborhood for satellite television in North Africa and the Middle East. The 7/8° West arc, already hosting Eutelsat and Nilesat satellites, broadcasts over 1,000 channels to more than 30 million homes and represents one of the fastest growing neighborhoods for digital services. This orbital position will get a further boost in the second half of 2015 with the launch of Eutelsat 8 West B.

### **Samsung 55 and 65-inch UHD TVs are to join its 85-inch 4K LED model**

Samsung first unveiled its 4K UHD television line in the form of a massive 85-inch model at CES this year, but the company did promise that it would expand to both larger and smaller models. Now, the company has officially announced that it will be bringing 55 and 65-inch models to market. They will feature its Smart TV upgrade platform, which allows users to connect a “Samsung Evolution Kit” and refresh the device each year. Users should then be able to enjoy the latest features without having to purchase a new TV. The company also says that the TV itself will be able to handle upscaling, so standard and high definition content should appear sharp. The 4K models will include “Micro Dimming Ultimate” technology. This technology analyzes the screen and optimizes the LED backlight and video signal in real time, which can lead to a 20% increase in brightness. It creates darker blacks and whiter whites. <http://www.samsung.co.kr>



### **Panasonic promises 4K “everything” by 2014**

Kunihiko Miyagi, president of Panasonic’s imaging division, has told *The Hollywood Reporter* that his company’s plans for 4K embrace the entire TV production cycle. “We are developing a 4K system – a whole set of products – to allow for affordable 4K production,” he said. “Everything we make in HD will be 4K.” He says that the production plans covered shoulder-mounted broadcast cameras, as well as handheld camcorders and a 4K version of its popular VariCam units. Miyagi added that although Sony’s impressive F65 and the Red Epic high-end cameras are already in the market and being used by film-makers, there were still opportunities for Panasonic in the “missing link” alongside cinema production. “The direction we are coming from is to rationalize the 4K workflow and make it as cost effective as possible,” he said. <http://www.panasonic.com>

### **AUO reaches 65% yields for Ultra HD TV panels**

AU Optronics (AUO) is reportedly reaching yields of 60-65% for its Ultra HD (3840x2160) TV panels. AUO president Paul Peng recently said the company is striking deals with major TV vendors across the globe and expects to start shipping mass amounts of the Ultra HD TV panels by the end of first-quarter 2013. The president also said that AUO’s Ultra HD TV panels at present will cost about twice as much as Full HD TV panels to produce but that the company is working hard to lower the costs in order to make the panels more prevalent in the market in the future. <http://www.digitimes.com>

### **Innolux tackles Ultra HD TV panel orders from Japan and China-based TV vendors**

Innolux Corporation is reportedly trying to enter the Ultra HD TV supply chains of multiple TV vendors including Sony, Toshiba, Haier and Skyworth to provide Ultra HD TV panels, according to industry sources. Innolux is set to ship approximately two million Ultra HD TV panels in the first quarter of 2013 and expects that its Ultra HD TV panel shipment proportion will increase from 5% during the time period followed by 10%, 20% and 30% in the second, third and fourth quarters, respectively. The sources also noted Innolux is improving its AMOLED TV panel production yields and may be able to catch up to Korea-based AMOLED TV panel makers in the future. <http://www.digitimes.com>

### **4K on the way as SES increases global reach to 276 million homes**

Strong gains, especially in India and Germany, have been the driving force behind SES increasing its global reach to 276 million TV homes worldwide by the end of 2012. In addition to posting this yearly rise of over 17 million homes, the satellite operator also confirmed that plans were well under way with leading consumer electronics

firms to develop an ultra HD delivery ecosystem for 4KTV services. In terms of its customer gains, SES revealed that India was the star performer during 2012 with a year-on-year gain of 7.5 million TV homes through the Dish TV and Airtel Digital TV DTH platforms which now reach 25 million Indian TV homes. SES also revealed that the Indian DTH market was growing fast, with an average increase of more than 800,000 subscribers per month in 2012. Analogue satellite switch-off and the success of the platform HD+ were the main drivers of growth in Germany where satellite reach grew by more than 500,000 to over 18 million homes in 2012. In Europe 85 million TV homes receive their signal from satellites, up from 84 million in 2011, and satellite has increased its reach in Europe by 17% over the last four years. SES ASTRA craft now serve 143 million European TV households (including indirect cable and IPTV reach), equivalent to just under three-quarters (73%) of all European satellite homes and four-fifths of all European satellite HD homes. Looking to where the future value added services would be, SES suggested that by 2014 it would be at the heart of plans to develop 4KTV and by that time major events will be captured in ultra HD. It added that the timeline for 4K service delivery will be shortened by the adoption by the industry of the H.265/HEVC standard which it believes will reduce significantly bit rates. <http://www.ses.com>

### Utah Scientific announces 4K routing switcher

Utah Scientific announced a major extension of the Utah-100/UDS routing switcher family with a new range of routing switchers offering 6Gbps UHD-SDI signal capabilities to support new 4K signal formats (both single and multi-link) used in ultra-high-definition TV production. The 6Gbps UHD-SDI solutions will provide twice the density, at half the power), and outstanding performance at a substantially lower cost than competitive 3Gbps multi-link solutions. Utah says its 100/UDS 4K routers are available in 32x32, 64x64, and 144x144 matrix sizes, and they offer the same control options as the successful Utah-100/UDS routers introduced in 2012. Complementing the new 4K routers will be a 4K signal-processing module that provides multiplexing and demultiplexing of 1.5 and 3Gbps streams to and from the 6Gbps format. This modular system is based on I/O modules with 16 ports, interconnected by a crosspoint fabric that allows any input signal to feed any number of output ports. For mixed-signal applications, the new 4K routers can also be fitted with 3G cards from the Utah-100/UDS family, providing a full range of connectivity options including coax, fiber, IP-video, and DVI/HDMI interfaces. The Utah-100/UDS 4K routers are controlled and monitored through a built-in Web interface that allows users to operate the system from a Web browser for local or remote control. Hardware control panels and an iPad app are also available to control the routers. <http://www.utahscientific.com>



### 3DTV homes set to rocket but glasses remain a problem says Informa Telecoms & Media

The number of 3DTV homes will rocket from 13.5 million at the end of last year to over 100 million by 2017, according to DTVE publisher Informa Telecoms & Media. However, the 3DTV sector faces several challenges including a lack of content, scarcity of channels, high production costs and the fact that many viewers do not like wearing glasses. There is currently a fierce debate in the industry as to whether 3DTV has a viable future, but Informa says that the sector will grow strongly because of the backing of key industry players including set manufacturers, platform owners and the Hollywood studios. The 112.7 million 3D homes by 2017 will be about 8% of the all global TV households. "The market will still be immature by 2017, so some growth opportunities exist beyond this date," the media intelligence company noted. "Informa believes that 3DTV set penetration will take off, as TV set manufacturers embed the technology into a high proportion of their sets. But take up of 3D content services will be limited, at least until the technology has progressed significantly so that a natural viewing experience, without glasses, is achieved." By region, Asia Pacific will have the most 3DTV homes by 2017 with 49.6 million. North America will have 33.2 million homes and Western Europe 18.3 million. Latin America will have just 5.6 million 3DTV homes and Eastern Europe and the Middle East 5.8 million. By country the US will continue to be the dominant active 3DTV territory, recording 31.9 million active 3DTV households by end-2017. China follows with 30 million, then Japan with 7.6 million and Germany 4.4 million. <http://informatandm.com>

### Philips and Sharp show off 85-inch 8K4K naked-eye 3D display

Philips and Sharp have developed a 85-inch 8K4K naked-eye 3D LCD display. Sharp developed the display, and Philips' own lenticular lens was mounted on its surface so that 3D video can be viewed with the naked eye. While Philips is considering using the display for digital signage, etc, Sharp said that it has not yet decided anything in

regard to commercialization. The size and pixel count of the 8K4K display are 85 inches (1.9x1.05m) and 7,680 x 4,320, respectively. Its pixel pitch and brightness are about 0.25mm and 300cd/m<sup>2</sup>. The number of colors that it can display is about one billion (10 bits for each of red, green and blue), which is larger than the number of colors that can be displayed on a full-HD display. The frame frequency of the new display is 60Hz. This time, Philips mounted its own “fractional lenticular lens” on the display. There are several points (viewpoints) that are optimal for viewing 3D video displayed on a naked-eye 3D display using a conventional lenticular lens. When the eyes of the viewer are not positioned at any of those points, it is impossible to accurately view 3D video correctly. Displays used for digital signage are usually viewed by passers-by. So, they see the displays while passing over optimal viewpoints. As a result, 3D video is interrupted. The fractional lenticular lens enables passers-by to naturally view 3D video because Philips made improvements to the position and shape of the lens.

### Japan Display exhibits head-tracking naked-eye 3D display

Japan Display Inc. exhibited a naked-eye 3D display that tracks a human head. The display tracks the movement of the head with a compact camera mounted on the top of it and adjusts a 3D image based on the movement data. The display realizes 3D images free from pseudo-stereoscopic effect, Japan Display said. They also displayed several automotive displays. One of them was an LCD display with holes. It can be used for making, for example, a “hybrid meter” by combining (mechanical) meter needles and (virtual) meters shown on the display. If a camera is embedded in one of the holes, the display can possibly be applied to the above-mentioned naked-eye 3D display. <http://www.j-display.com/english>



*The naked-eye 3D display that tracks the movement of the head (left) and the curved display using an in-cell touch panel (right)*

### Foxtel scraps 3D

Australian pay-TV provider Foxtel is joining the movement away from dedicated 3D services by confirming its 3D channel will be axed at the end of August. The low rate of take-up in the country has already prompted international content producers to axe their 3D output and now Foxtel is the latest company to follow suit. In a statement, Foxtel said its 3D channel would be removed from the on-screen and online TV guides on August 27. Foxtel says in light of the recent moves by the BBC and ESPN and other 3D content producers around the world, as well as the lack of interest by Australian audiences of 3D television, it is no longer viable for IT to maintain a dedicated 3D channel. Foxtel says it will continue to show 3D movies on its On Demand service.

### BSkyB keeps the faith with 3D

BSkyB is at 500,000 3D viewers, according to John Cassy, director of Sky 3D. Cassy was responding following the announcement that ESPN would shut its 3D channel at the end of this year. The Disney-owned sports franchise said the level of interest necessary to maintain the network hasn't materialized. ESPN 3D was launched in June of 2010 to coincide with the FIFA World Cup. The BBC has likewise announced its retreat from 3D, the *Radio Times* reports. Cassy goes on to say that there have been challenges on the road to 3DTV. “The market isn't quite where some people had hoped it would be by now,” he said. There was speculation in the professional video industry when 3DTVs were introduced in 2010 that the format was being rolled out half-baked. Stereoscopic sets required viewers to wear shutter glasses and sit in a sweet spot to see the glory of 3D. The glasses naturally tend to darken the screen, as well. Sky recognizes that 3D isn't for everyday viewing, but rather more suited for big events. Sky is further encouraged by conversations with TV manufacturers who say affordable glasses-free TV is two to four years away. <http://corporate.sky.com>

### BBC puts 3D projects on hold due to lack of public appetite for the technology

The British Broadcasting Corporation will take a three-year break from developing 3D programming at the end of this year. The BBC's two-year pilot for 3D has not inspired the viewing public to take to the medium. During this pilot period the Corporation has experimented with televising several shows and events in 3D, including its flagship entertainment format *Strictly Come Dancing*, the David Walliams children's drama *Mr. Stink*, natural

history documentary *Walking with Dinosaurs*, and last summer's Olympic Games. However, even though an estimated 1.5 million UK households now own 3D enabled televisions the BBC's 3D coverage of the Olympics Opening Ceremony was only watched by around half of all 3DTV owners in the UK. Last Christmas' broadcasts of *Mr. Stink* and the Queen's Speech proved to be even more disappointing, drawing the interest of less than 5% of potential viewers, it has emerged. The BBC's 3D project will culminate in the 3D Doctor Who anniversary episode this November as well a natural history program called *Hidden Kingdom* which have to be seen through. <http://www.bbc.co.uk>

### **IHS reports that Blu-ray 3D sales grew by 56%**

A report from IHS Screen Digest says that a small group of niche consumers is continuing to back Blu-ray 3D, and that sales Blu-ray 3D sales in the US grew by 56 per cent last year, and that Blu-ray 3D – in terms of value – now makes up 9.5 per cent of the whole US Blu-ray market, and was worth \$218 million last year. The IHS report further says that while few consumers have the requisite 3D playback hardware, Blu-ray 3D is “set to continue to grow”. However, the report also says that to date, the adoption of 3D in the home “has failed to match the depth experienced in theatres and cinemas”. In fact, the take-up by consumers – either of 3D sets or playback hardware has been less than forecast and the industry had hoped for. In terms of broadcast (pay and FTA) 3D is nascent at best, with the likes of ESPN pulling back and even the limited experimental transmissions from the BBC coming to an end. The IHS study says that despite servicing this niche home market, the studio release pattern of Blu-ray titles in 3D is continuing at a steady pace. Last year, 196 Blu-ray 3D titles were released in the US compared to 106 the previous year. This year, the number is likely to exceed 250 titles. <http://www.ihs.com>

### **Cameron|Pace and ESPN 3D win sports Emmy for Winter Games**

Cameron|Pace Group announced that it has won a Sports Emmy Award with ESPN 3D for coverage of the 2012 Winter X Games 16. ESPN 3D and Cameron|Pace Group captured the award for Outstanding Technical Team Remote for its 3D broadcast from Aspen, Colorado. This year's Sports Emmy marks the latest chapter in NATAS's recognition of CPG's 3D broadcast expertise. In 2011, CPG earned the George Wensel Technical Achievement Award for coverage of the 2010 U.S. Open Tennis Championship. CPG also received a Sports Emmy in 2012 for its broadcast of Winter X Games 15. The 2012 Winter X Games required the deployment of 34 camera systems in six different event locations, some at altitudes higher than 9,000 feet. Five different rig variations, ranging from handhelds to robotic cameras, were used to capture the action. CPG's broadcast solutions for Winter X Games 16 built on the company's leadership in producing the technology and methodologies necessary to make integrated 2D and 3D (known as 5D) productions attractive and scalable options for mainstream broadcasts. To accomplish this, CPG has developed products that embed 3D functionality into existing 2D production models without sacrificing flexibility or mobility.

### **Sensio unveils 3D VoD service in US**

Calling it “the world's first and only dedicated 3D transactional VoD service”, Sensio is hinting that 3DGO! will soon work on multiple television platforms supporting Sensio Hi-Fi 3D technology. At launch, however, the service is only available on Vizio Inc. smart TVs with theatre 3D. The service requires an app download from the Yahoo Connected TV store along with a 3DGO! account. Over the last year, Sensio has announced several 3D licensing deals for 3DGO! Content partners include Walt Disney Co., Paramount Pictures Corp., Starz Entertainment LLC, Big Picture Digital Productions, and National Geographic Cinema Ventures. The service offers more than 40 titles ranging in price from \$5.99 to \$7.99 for a 24-hour rental. Many consumer electronics manufacturers and service providers are still pushing 3D technology, but adoption remains lackluster. At the end of 2012, Leichtman Research Group Inc. (LRG) found that only 6% of US homes have a 3D-capable TV, and 41% of those households never watch any 3D content. <http://www.vizio.com/>

### **3net Studios adds 3D and 4K projects to its slate**

3net Studios, the global production company from Sony, Discovery and IMAX, has initiated principal photography on a couple of new 3D projects and is now in development of three more in native 4K format. 3net Studios has begun principal photography on 3D original series *Turn & Burn*, a six-episode, hour-long, non-scripted reality program featuring the artistry and antics of El Reyes Garage in Venice, Calif., as well *Dark Secrets*, an eight-episode, half-hour series with fictional recreations of supernatural psychic events. The company said it is in the final stages of post-production on an all-new, 12-episode season of *Hillbilly Blood: A Hardscrabble Life*. The half-

hour show is slated for a 3D/2D simulcast debut on 3net and Discovery's Destination America. On the ultra HD front, the studio has put three new 4K original documentary and natural history series in active development: National Parks Adventure, Metropolis and Made by Man. "The global growth of 3D TV into the home increased by 72% in 2012, and we're starting to see the impact of those 41 million new sets sold last year as consumers around the world look to their entertainment providers for compelling, original 3D content," said Tom Cosgrove, president and CEO of 3net and 3net Studios. <http://www.3netstudios.com>

### **LG boosts 3DTV functionality with new connected TV app**

The latest in a murmuring of activity regarding development of 3DTV has arrived in the form of LG's approval of 3doo's Player App for download and installation on its line of smart TVs. By installing the 3D media Player App, LG has extended what is claimed to be the world's only global 3DTV media and entertainment platform reaching ten million consumers in 87 markets. 3doo directly connects content providers, electronic manufacturers, movie studios, and television stations with end users in an open marketplace. The Player App is also available pre-installed on Panasonic's 2012 and 2013 VIERA 3DTVs globally, placing the 3doo platform alongside other premium entertainment services such as YouTube, Netflix, Amazon Instant Video and Hulu. The company also plans to engage all owners of 3D smart TVs, 3D smart phones, tablets and mobile devices of all relevant brands worldwide as part of a strategy to expand its user base to a potential 60 million 3DTV units worldwide in Q2 2013, and more than 350 million by 2015. The company is also introducing 3D commercials and premium TV advertising formats. <http://www.lg.com>

### **IHS reports growing US interest in smart and 3DTVs**

For years, US consumers have had three simple criteria when buying a television: price, size and picture quality. While those factors remain, American television buyers now are placing increased importance on technology features, including Internet connectivity and 3D display, according to the Smart TV Consumer Survey conducted by the IHS Screen Digest TV Systems Service. Among US consumers who planned to purchase a television during the 12-month period following the completion of the survey, 30.7% said they would buy an Internet-connected set. In comparison, only 18.1% of consumers that bought a television during the 12 months before the survey said they desired an Internet-connected set. Meanwhile, 18.8% of consumers planning to buy a television said they intend to purchase a 3D model, compared to 6.6% for those who already bought a set. "Features most commonly found on high-end TV models and bigger screen-size sets, like 3D and Internet-connectivity, are becoming more important to US consumers," said Veronica Thayer, TV systems analyst at IHS. "But the appeal of 3DTV remains far lower than that of Internet-enabled sets – often marketed as smart TVs." IHS advises that LCD TVs that employ LED backlighting technology have attracted the most consumer attention. This is largely because of targeted ad campaigns for LED TVs that highlight a thinner bezel, brighter screen and more vivid colors. Results indicate that 30% of US consumers who purchased a television 12 months before the survey said that the LED TV proved to be a main purchase driver. Along with consumer preference, other factors are making LED backlighting more popular, with LED TV shipments in the United States soaring to almost half of total TV set units in 2012, and surpassing those of CCFL-backlit LCD TVs for the first time. The price gap is shrinking between LEDs and LCD TVs using the older CCFL backlighting technology. Meanwhile, more LED TV models are available. The biggest factor driving television purchasers among US consumers during the 12 months before the survey was the desire for a larger set. Half of consumers indicated size was a factor in their purchase. This percentage declined to only 48% for those planning to buy a television. The study also revealed that interest in bigger screen sizes is increasing in the United States, with 36% of consumers planning to buy a TV of at least 50 inches, up from 24% among consumers that purchased a TV the previous year. However, price was the biggest factor for those planning to buy a set, at 53%, up from 27.9% for those who already bought a set. <http://www.ihs.com>

### **China's Hunan TV goes S3D with Quantel**

Hunan TV, a Chinese entertainment television channel, has purchased a third Quantel Enterprise sQ production system for its Stereo3D program production. The division of Hunan Broadcasting Group has been a Quantel customer since it chose two Quantel Enterprise sQ systems in 2008, and then upgraded to a full HD workflow in 2010. The new Enterprise sQ system handles ingest, editing and output of S3D media within an integrated S3D workflow. The production system will be used in the new studio to produce 3D content in line with new regulations. Hunan TV says it chose Quantel Enterprise sQ because its video quality is much better than other systems. The

Enterprise sQ workflow is much quicker, with an excellent time-to-air. Enterprise sQ collaborative workflows enable them to produce a lot of 3D content in a very short space of time. It allows a number of editors to work simultaneously on different sections of a program. <http://www.quantel.com>

#### **VITEC releases world's fastest HD H.264 IP streaming codec**

VITEC announced the official release of its new portable encoding/decoding appliance - MGW Sprint. The MGW Sprint Encoder and MGW Sprint Decoder are a set of portable appliances with HDMI, DVI and HD-SDI inputs and outputs that stream unicast and multicast 4:2:2 and 4:2:0 video with an end-to-end delay of under 1 video frame. The compact units feature no moving parts, making it 100% silent, and produce superb picture quality over IP. Since 1988, VITEC has been a worldwide leading provider of powerful digital video products supporting end-to-end media solutions for broadcast, corporate, education, government, hospitality, industrial, medical, and military. By integrating brands including Optibase, Focus, Proxsys, Stradis, Extensor, and Sylon, <http://www.vitecmm.com>

#### **Vanguard Video announces multi-platform support for H.265/HEVC**

Vanguard Video announced H.265/HEVC codecs for a broad range of hardware and software platforms, including x86, ARM, OpenCL GPU, and FPGA IP Cores. Vanguard Video announced version 1.1 of V.265, its pure software codec, which supports both Main and Main10 (10-bit, 4:2:0) encoding profiles, real-time 1080p30 encoding, real-time 4Kp60 decoding, ultra high-quality dual-pass encoding, and an extensive set of optimizations for broadcast, video teleconferencing, and internet streaming. Also included in V.265 is a highly optimized, multi-core, real-time HEVC decoder, supporting the NEON SIMD optimizations. This provides developers the technology to create HEVC players on most existing Android and iOS smart phones and tablets. Vanguard Video is previewing an OpenCL GPU HEVC encoder accelerator that more than doubles the performance of the V.265 software encoder running on the main processor. The company showcased a hardware-based HEVC Intra-frame encoder which implemented on Xilinx Kintex-7 and Virtex-7 reference platforms. The HEVC encoder is provided as an IP core to developers to integrate into their video processing FPGA solutions. <http://www.vanguardvideo.com>

#### **Peerialism AB announces Hive Streaming**

Peerialism AB announced how Hive Streaming, a built-in technology on Microsoft Corp.'s Windows Azure Media Services Live platform, can help address the challenges associated with streaming live and linear video. Hive Streaming is a software based content distribution solution that can be easily deployed by network administrators, broadcasters and content aggregators in order to efficiently deliver live and linear video over enterprise networks, private networks, and the Internet. Hive is hosted on Microsoft's Windows Azure platform, and will be available as a built-in component of Windows Azure Media Services Live. As a built-in component, Hive can be used as a highly cost-effective and qualitative way for organizations to distribute video with or without the use of a traditional CDN. Hive can be easily integrated into most existing content management and player environments and is currently being used by a select number of large enterprise customers for video distribution. Hive will soon be available for partners and customers around the world via Windows Azure Media Services and through the Windows Azure store. <http://peerialism.com>

#### **ATSC makes more advances in TV standardization**

In the future, broadcast TV signals around the world will accommodate 4KTV, immersive audio, interactivity, multiscreen viewing, mobile devices and hybrid services. This is the underlying goal of ATSC 3.0, the TV transmission methodology now in development at the Advanced Television Systems Committee, a consortium of broadcasters, vendors and trade groups involved in standards development. The ATSC announced that 10 proposals have been submitted for the foundation of 3.0 known as the "physical layer". This physical layer includes the modulation scheme, which defines how the signal information is carried by a radio frequency – in this case, the TV channel. ATSC 3.0 will be a radical departure from the current standard. ATSC 1.0 was developed around 20 years ago, when cell phones were analog and streaming was unheard of. It relies on 8-VSB modulation capable of delivering 19.39 Mbps in a 6 MHz TV channel – enough to carry a high-definition program compressed by a factor of 50 using MPEG-2 to a fixed receiver. The simultaneous development of dual broadcast transmission standards reflects how rapidly the technology is evolving. The current standard, ATSC 1.0, was implemented before texting and didn't anticipate transmission to mobile devices. ATSC 2.0 will enable over-the-air video-on-demand, online interactivity, push alerts to sleeping TVs, and the ability to watch two channels simultaneously on a single screen, among other functions. It will also continue to support the type of linear service now enabled by ATSC 1.0. ATSC



2.0 was initially on track for completion by mid-2012, but delays ensued. While it has not yet gone to ballot as a candidate standard a source familiar with its development says “the pieces are falling into place fairly rapidly now – standardization in the fall is not an unreasonable target.” The source said adopting ATSC 2.0 is a “fairly low bar” for broadcasters and TV manufacturers. “Authoring tools need to be developed for broadcasters, but are not particularly daunting in terms of complexity and cost, and many of the needed changes in TV sets are software-based, at least for smart TVs that are by definition Internet-enabled, so manufacturers won’t have to deal with large bill of material increases in the sets.”

With ATSC 3.0, the committee seeks to increase that data rate by 30%, or roughly 25.2Mbps. The overall intent of 3.0 is to enable seamless transmission of HD, 4K, 22.2 audio and other data streams to fixed, mobile and handheld devices in all types of terrain. The functional requirements set forth for ATSC 3.0 support that goal by emphasizing flexibility and scalability, e.g., adaptive and variable bit rates, various Quality-of-Service methodologies, independent data pipes, multiple concurrent service support and bandwidth agility. The “physical layer shall support configurations for differing coverage scenarios, topographies and morphologies,” the 3.0 Physical Layer Call for Proposals states. “Seamless changes to robustness and data rate of portions of streams shall be enabled.” Support for single-frequency networks, such as those used in distributed transmission systems, is included by way of tolerance for “long man-made echoes.” Distributed transmission systems are favored for mountainous areas because they use synchronized multiple terrestrial transmitters rather than one large one that can leave coverage gaps. The most differentiating characteristic of ATSC 3.0 is that it will not be backward-compatible with 1.0 or even 2.0, which is now in development. In other words, televisions now capable of processing over-the-air TV signals will not be able to decode ATSC 3.0 signals. It is also being developed with a global perspective in mind, meaning that modulation schemes other than 8-VSB – particularly co-orthogonal frequency-division multiplexing, or COFDM – will likely be on the table. The goal is to produce a candidate standard by 2016. <http://atsc.org>

#### **Toshiba introduces interface bridge IC integrating de-interlacing and video scaling functions**

Toshiba Corporation announced that it has launched “T358749XBG”, an interface bridge IC from HDMI to Mobile Industry Processor Interface (MIPI) that integrates video de-interlacing and video scaling. Sample is available and mass production is scheduled to start in December this year. The new IC’s integrated video preprocessing functions of video de-interlacing, video scaling and video format conversion replace software processing and significantly reduce memory bandwidth and video processing requirements on the host processors deployed in consumer electronics. The IC supports multiple audio interfaces, including I2S, TDM, S/PDIF, and MIPI Serial Low-power Inter-chip Media Bus (SLIMbus), enabling use in a wide range of applications. Key features are integrated video de-interlacing, video scaling and video format conversion, contributing to reduce memory bandwidth and video processing requirements on the host processors; HDMI 1.4 support with up to 1080p @ 60fps video format (RGB, YcbCr444: 24-bpp, YcbCr422 24-bpp), HDCP 1.3, and 3D support; availability of any of the four audio interfaces: I2S, TDM, SPDIF or SLIMbus; maximum 1Gbps/lane link speed MIPI CSI2 interface; maximum 165MHz HDMI clock speed. Applications are a wide range of consumer electronics and industrial applications, such as smart set-top boxes, TVs, monitors, and small form-factor PCs. <http://www.toshiba.co.jp>

#### **IHS says large-sized LCD panels log surplus in 1H13**

A glut of large-sized liquid-crystal display panels used in the television and information technology sectors arose at the end of the first half this year as production consistently outpaced shipments, according to market researcher IHS. A total of 47.7 million square meters of LCD panels for use in televisions and public information displays were produced globally during the first six months of the year. Shipments amounted to 46.8 msqm. This meant that production for TV panels exceeded shipments by 2 percent. Meanwhile, 18.4 msqm of LCD panels were produced during the same period for the monitors, notebook computers and tablets comprising the IT sector. Shipments also came out lower at 18 msqm, similar to what occurred in the TV sector, so that IT panel production exceeded shipments by 2.6 percent. “The large-sized LCD panel market in the first half of 2013 suffered from slow demand, primarily driven by an underperformance of sales in China, the world’s biggest LCD TV market,” said Ricky Park, senior manager for large-area displays at IHS. “In all, TV set makers proved unable to generate growth during the first half despite a slew of holidays, including the Lunar New Year and Labor Day, plus last-minute promos put up just before the end of the Chinese government’s subsidy program in May to encourage new consumer purchases.” IHS said the same lackluster demand was in evidence for panels in the IT sector, where consumers and

businesses alike showed little enthusiasm for buying new monitors or laptop PCs. Instead, devices like smartphones and tablets were the preferred items of purchase, selected for their appeal and ease of use, Park said. Given the slow demand, panel makers reduced utilization rates for their fabs to 79 percent during the first half, 5 percent lower than the average recorded during the second half of 2012. Still, the deliberate curtailment in fab utilization was not enough to prevent an increase in accrued panel inventory. Accumulated stockpiles for TV panels amounted to 8.7 msqm, up 12 percent from the second half last year. For IT panels, the figure was 2.9 million msqm, an increase of 19 percent. The slow demand and high inventory of the first half resulted in a price drop for panels during that time frame. The open-cell price of 32-inch high-definition, 60 Hz TV panels fell by 7.5 percent, while that for IT panels was down approximately 4 percent. <http://www.ihs.com>

### **Primetime linear TV still rules the world, Ericsson finds**

Reports of the demise of primetime TV are premature, according to data from Ericsson's ConsumerLab. Of thousands queried worldwide, 85% said they watch appointment TV in the evening at home. "Linear TV still has an important role for consumers, and we don't see any decline in frequency of usage," said Anders Erlandsson, senior researcher at Ericsson ConsumerLab. ConsumerLab's latest Insight Summary Report emphasized the viewing behavioral phenomena du jour, such as time and place-shifting, but the numbers indicated that the TV in the living room remains at the top of the charts. Survey respondents watched TV on TV, at home, an average of nearly 14 hours a week. Desktop watching was next at less than half that amount. Smart-phone viewing comprised less than four hours a week. The primary difference is that people are using mobile devices while they're watching traditional, linear TV. "The average home entertainment setup is moving away from using separate TVs in each room," the report said. "Instead, a growing number of households use a large main TV supplemented by a number of mobile devices that provide access to services from anywhere in the home." TV is evolving into a multiscreen, multitasking activity: 75% of respondents said they multitasked with mobile devices while watching; 25% watched video on a device while also watching TV. The top activity was reading e-mail (63%) followed by random web surfing (56%); intentional web surfing (49%); using social media (40%); chatting about the show (29%); competing with others about the show (14%); watching the same show from different camera angles (14%); voting (13%); betting (13%). The preferred content on linear TV was live events, which were more closely linked to social viewing. On-demand content was more likely to be bounced in terms of time and place. One changing characteristic of on-demand viewing is the migration away from physical media. Streamed TV and video showed slight growth over the last two years, while downloaded and recorded content declined. On-demand content was also subject to place-shifting. "The continued viewing function of many on-demand services is driving a new phenomenon known as 'place-shifted' viewing," the report said. "This involves consumers watching one piece of content over a period, in a number of different situations, by using the same service on different devices. It enables them to break up the viewing of the content and turn a single episode or film into a mini-series; they may watch the first five minutes on the bus, followed by half an hour at lunch and then finish the episode while waiting for friends at a café." <http://www.ericsson.com/thinkingahead/consumerlab>

### **Gefen's new 4x1 switcher for HDMI delivers resolutions up to 4K supporting Ultra HD displays**

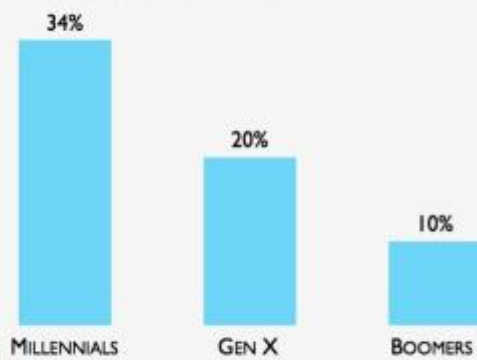
Digital connectivity solutions provider Gefen announced that its 4x1 Switcher for HDMI 4k/2k is available to order, with shipments beginning in October 2013. This new switcher connects four high definition sources using HDMI to one display. HDMI 2.0 support is included for this and all Gefen Ultra HD products supporting 4k 60Hz resolutions with 3D pass-through. The inclusion of Gefen FST (Fast Switching Technology) virtually eliminates signal latency, providing an instant switch of audio/video content. These new features and the fact that it can also support 1080p full HD makes the new 4x1 switcher for HDMI 4K/2K best suited for installations that have upgraded their display to 4K and still want access to their sources such as gaming consoles and satellite set-top boxes as well as laptops and computers. Ultra HD content will be delivered at 4K resolutions while high definition content will be delivered at 1080p resolutions. Full HDCP (high-bandwidth digital content protection) compliance, and support for lossless audio formats such as Dolby TrueHD, and DTS-HD Master Audio complete the features. As a Gefen ToolBox product, this switcher comes in a flat black or white wall-mountable enclosure that can be discreetly mounted behind the display or anywhere that is convenient for the integrator, providing an alternative to traditional rack mount equipment. Control options include traditional push-button access, IR remote, RS-232 or IP via Telnet and UDP. This switcher can also upgrade its firmware from anywhere by using the mini-USB and IP ports for a lifetime of performance. <http://www.gefen.com>

**Third of millennials watch mostly online video or no broadcast TV, says NY Times and Pew**

Thirty-four percent of millennials surveyed watch mostly online video or no broadcast television, new research from *The New York Times* says. The study surveyed more than 4,000 online video users. Among other findings: news sites were more popular than sports for online-video watchers, but they were far less popular than video hosting sites like YouTube. Users reported spending the most time with funny videos, movie clips, music videos and then news. When it came to a choice between reading the news or watching a news video, 50% said they would choose the latter if they wanted to be entertained. And 59% said they'll likely watch pre-roll ads if they know they won't have to wait long for their content. Pew also released research about online video use. The study found that people with higher incomes and educational levels were more likely to watch news videos.

**1 in 3 Millennials watch mostly online video/no broadcast TV**

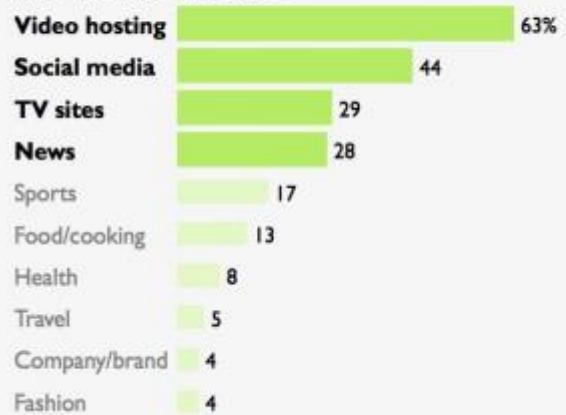
WATCH MOSTLY ONLINE VIDEO/NO BROADCAST TV



Base: Qualified Millennials (18-34), n=962; Gen X (35-49), n=726; Boomers (50+), n=623  
Source: 2013 New York Times Video Study

**Video hosting sites most popular for video, followed by social media**

TYPES OF SITES/APPS USED FOR VIDEO



Base: Total qualified, n=2,344. TV includes network sites/apps, basic cable sites/apps, premium cable sites/apps, pay-TV provider sites/apps  
Source: 2013 New York Times Video Study

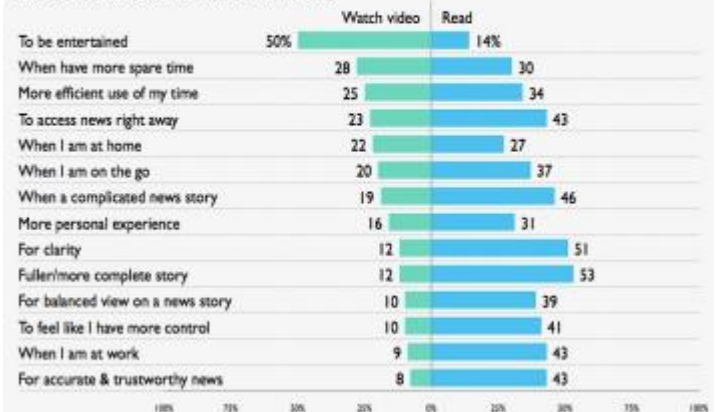
**More minutes per video and videos per sitting for news and music**

TOP 10 ONLINE VIDEO TOPICS	How Long! (min.)	How Many!
Funny video clips	1-2	2-3
Movies/movie clips/trailers	Doesn't Matter	1
Music videos	3-5	2-3
News/current events	3-5	2-3
Instructional/how-to	3-5	1
TV shows	Doesn't matter	1
Sports	Doesn't Matter	1
Weather	1-2	1
Entertainment/culture	3-5	1
Live-streaming, real-time	Doesn't Matter	1

Base: Total qualified, n=2,344. For time and number watched, variable base - watch entire video about topic  
Source: 2013 New York Times Video Study

**Even when comes to news, they want to be entertained**

REASONS FOR READING VS. WATCHING A VIDEO



Base: Watch online news stories, n=1,204  
Source: 2013 New York Times Video Study

**OFDM-based "Futurecast" ATSC 3.0 proposed by LG, Zenith and Harris**

One of the primary developers of the current 8-VSB over-the-air broadcast transmission standard is proposing a future system based on OFDM. Backers of the two technologies came to loggerheads in the 1990s when the first-ever DTV transmission standard was being adopted in the United States. 8-VSB won out. Now, Zenith, which

patented 8-VSB, the core technology behind the current over-the-air U. DTV transmission standard, along with parent corporation LG, and Harris Broadcast, are proposing a standard based on orthogonal frequency demodulation, or OFDM. They are calling it the "Futurecast Universal Terrestrial Broadcasting System." The three companies say Futurecast UTB provides a 30% improvement in data throughput over the current 8-VSB standard while maintaining reception coverage and improving "multipath performance for fixed and portable TV reception." The 250-page proposal was submitted to the Advanced Television Systems Committee for the development of ATSC 3.0, the next-generation DTV transmission standard. LG says the Futurecast model "includes energy-saving features for consumer receivers and enhanced indoor TV signal penetration, thanks to flexible coding choices. Advanced modes also deliver very high data rates or very robust transmission capabilities." LG further said the system supports single-frequency networks and/or multiple transmitters and uses a single RF transmission's flexible physical layer profile to assure optimum quality-of-service. The extensible new system is designed to support evolution to future broadcast systems beyond ATSC 3.0. <http://www.tvtechnology.com/article/ofdm-based-%E2%80%98futurecast-atsc--proposed-by-lg-zenith-and-harris-revealed/221693#sthash.Kjuy32AA.dpuf>

### New Crestron extenders support HDBaseT and 4K Ultra HD

Crestron has released two new models of its line of HDMI extenders. The HD-EXT3-C and HD-EXT4-C support 4K resolution content and can transmit HDMI long distance via HDBaseT using standard CAT5e/UTP cable. Both the HD-EXT3-C and HD-EXT4-C support 4K signals and extend uncompressed, HDCP-protected HDMI content up to 330 feet (100 meters) via HDBaseT without signal degradation. Wall mount transmitters for each are available with black or white faceplates. In addition to HDMI in and out, the HD-EXT3-C also includes IR and RS-232 transmission. Instead of control ports, the HD-EXT4-C offers separate analog audio in and out to support DVI, or other devices that don't support embedded digital audio. The analog audio output of the transmitter can also feed a room amplifier or powered speakers. As a low-cost standalone system or as part of a complete Crestron control system the new HDMI extenders provide a signal extension solution that's simple to implement. No special configuration or programming is required – just connect the source and display and enjoy HD video and audio from across the room – or the other end of the home or building.



The transmitter mounts in a single-gang wall box, inside an equipment rack, or attaches to any flat surface. The receiver mounts behind a display device, projector or wherever necessary. The HD-EXT3-C transmitter and receiver (HD-TX3-C and HD-RX3-C) are also available separately. The HD-TX3 and HD-RX3 are designed for direct interface to an HDBaseT source or display, or as a single gang Crestron DigitalMedia transmitter or DM receiver. <http://www.crestron.com>

### Nielsen says 38% of Americans use Netflix

It's no surprise that more folks are streaming movies and "binge-watching" shows on Internet-based sites like Netflix, Hulu and Amazon. But a new study from Nielsen tries to measure just how prevalent so-called "over-the-top" services that don't rely on cable or satellite TV have become. Though precise viewership data is kept secret by those companies, a July survey of 2,000 consumers, half of whom use Netflix, allowed Nielsen to venture some estimates:

- 38% of Americans "use or subscribe" to Netflix, up from 31% last year, although Netflix claims only about 30 million subscribing households.
- 18% use Hulu, up from 12% last year, with 12% saying they use the free version and 6% using the subscription-based Hulu Plus.
- And 13% said they use Amazon Prime Instant Video, nearly double the 7% who said so last year.

The study also found 88% of Netflix users reported watching three or more episodes of a TV show in a single day, and 45% said they watch original series on streaming services, such as Netflix's Emmy-nominated *House of Cards*. Among Netflix users, 48% watch on a computer screen (up from 44% last year); 23% watch on a smartphone (up from 11%); 15% watch on their iPad, way up from 5% last year. But the percentage of users who reported using Roku or Nintendo's Wii game console dropped this year, reflecting the declining popularity of those devices. <http://www.nielsen.com>

**DVDO introduces first matrix switcher with support for 4K Ultra HD streaming and MHL connectivity**

DVDO, a provider of high-quality video connectivity solutions, announced the availability of the Matrix6, the first matrix switcher that brings 4K Ultra HD matrix switching to residential and commercial A/V systems. Developed for easy integration into whole home theater control systems, the Matrix6 switcher displays two 4K sources simultaneously on two TVs or projectors, removing the need for additional investment in source equipment. It features six HDMI-compliant inputs and two HDMI outputs with 4K Ultra HD and is the first matrix switcher on the market that also supports MHL connectivity. Two digital audio outputs are also provided to enable connections to A/V receivers and soundbars. The Matrix6 will be available in Q4, 2013 at an MSRP of \$499.99 from authorized DVDO distributors, dealers and online partners. Matrix6 supports two independent 4K Ultra HD streams while providing digital audio to an attached AVR, making it easy to view content in another room or on a second display without sacrificing performance or additional investment. MHL inputs on Matrix6 allow the user to mirror the content of their MHL-enabled smartphone or tablet on multiple displays, while charging the mobile device at the same time. <http://www.dvdo.com>

**Connected TV sets to double market share says Digital TV Research**

Connected TV sets will more than double their share of the overall market in four years, amounting to just over a quarter of all worldwide TV sets, partly due to new Internet-to-TV technologies for non-connected TV sets. TVs connected to the Internet will get to 759 million globally by 2018, up from 307 million expected at the end of this year, according to Digital TV Research. That's a market share going to 26.8% in 2018 from 12.4% at the end of this year. Connected TVs were at a 5.1% share in 2010, some 115 million TV sets. The movement can be partly attributed to new Internet-to-TV technologies for older TV sets. The use of other devices is important to this growth. Connected games consoles will rise to 176 million by 2018, or double the results in 2012. Smart TV sets will overtake games consoles connected to the Web this year. Smart TV sets will account for 34% of the 2018 total connected sets, or 259 million. The global total of connected TV sets via streaming/retail set-top boxes will reach 126 million in 2018, up from only 4 million in 2010. <http://www.digitaltvresearch.com>

**CEA publishes new DTV interface standard**

The Consumer Electronics Association (CEA) has published a new DTV Profile for Uncompressed High-Speed Digital Interfaces, the CEA-861-F. The move is important because it will offer a number of improvements, including support for Ultra HD and widescreen video formats, explained Brian Markwalter, senior VP of research and standards at the CEA. The standard applies to a variety of DTV-related high-speed digital physical interfaces, including the High-Definition Multimedia Interface (HDMI), Digital Visual Interface (DVI) 1.0, and Open LVDS Display Interface (LDI) specifications. CEA-861-F was developed by the Uncompressed A/V Digital Interfaces working group. In addition, the CEA also announced a CEA-861 PlugFest19 for the new DTV standard. The PlugFest will allow manufacturers to test the compatibility of their products with products from other companies to make certain they work together well before the products go to market. <http://ce.org>

**HDMI Forum releases Version 2.0 of the HDMI specification**

HDMI Forum announced the release of Version 2.0 of the HDMI Specification. This latest HDMI Specification, the first to be developed by the HDMI Forum, offers a significant increase in bandwidth (up to 18Gbps) to support new features such as 4K@50/60 (2160p), which is 4 times the clarity of 1080p/60 video resolution; 32 audio channels; as well as dynamic auto lip-sync and extensions to CEC. The complete Version 2.0 of the HDMI Specification is available to Adopters on the HDMI Adopter Extranet. Version 2.0 of the HDMI Specification, which is backward compatible with earlier versions of the Specification, was developed by the HDMI Forum's Technical Working Group whose members represent some of the world's leading manufacturers of consumer electronics, personal computers, mobile devices, cables and components. The HDMI Forum currently has a membership of 88 companies. The HDMI Forum has chosen HDMI Licensing, LLC to be the Agent to license Version 2.0 of the HDMI Specification. In this role, HDMI Licensing, LLC will provide marketing, promotional, licensing and administrative services, as well as education on the benefits of the HDMI Specification to adopters, retailers, and consumers. Version 2.0 of the HDMI Specification does not define new cables or new connectors. Current High Speed cables (category 2 cables) are capable of carrying the increased bandwidth. The HDMI 2.0 Compliance Test Specification (CTS) is expected to be released before the end of 2013. <http://www.hdmi.org>  
[www.hdmiforum.org](http://www.hdmiforum.org)

### 4K TVs allowed to display UHD logo without Ultra HD color space

In June of this year, DIGITALEUROPE announced the start of its work to develop a UHD logo program for Ultra High Definition consumer equipment. Now, DIGITALEUROPE announces its initial findings on the baseline capabilities of UHD consumer displays: native resolution: 3840x2160 pixels; aspect ratio: 16:9; colorimetry: ITU-R BT.709; color bit depth: 8 bit; frame rate: 24p/25p/30p/50p/60p; audio: PCM 2.0 stereo. DIGITALEUROPE's "Beyond HD" Group has concluded that these parameters will form a baseline for consumer UHD displays from their first market launches for the short to medium term. As display technology will continue to evolve, DIGITALEUROPE does not want to speculate beyond these baseline UHD characteristics until the consumer uptake of the new UHD products and services is understood. John Higgins, Director-General of DIGITALEUROPE notes: "DIGITALEUROPE's membership contains all of the major TV manufacturers and as such, is in a unique perspective to comment on how the nascent UHD market will develop. While many industry stakeholders speculate on the future UHD market, DIGITALEUROPE feels that the time is right to announce these initial findings to give some guidance to the market on short to medium term UHD Consumer Display capabilities." <http://pr.euractiv.com/pr/digitaleurope-announces-initial-findings-consumer-uhd-display-characteristics-99774>

### ATSC receives 10 initial physical layer proposals for next-generation TV broadcasting technologies

The Advanced Television Systems Committee (ATSC) has received 10 initial proposals from 19 organizations for the Physical Layer of the new "ATSC 3.0" broadcast television standard. With higher capacity to deliver Ultra High-Definition services, robust reception on mobile devices and improved efficiency, the new ATSC 3.0 standard is expected to redefine TV broadcasting for decades to come. The strong response to ATSC's call for proposals, issued on March 27, reflects a high level of enthusiasm in the industry for defining the modulation and error coding technologies in the transmission system that will provide a foundation for the next-generation terrestrial broadcast standard, according to ATSC President Mark Richer. <http://www.atsc.org>

### Planar summarizes interconnectivity specifications for 4K displays

Steve Seminario from Planar Systems recently offered an interesting comparison of connectivity solutions available to support 4K displays. <http://www.planar.com/blog/2013/7/30/>

Standard	# of cables	Resolution	Refresh rate	Bits per color	Comments
HDMI 1.1, 1.3	1	1920x1080	60Hz	8 bit	
HDMI 1.4a, b	1	3840x2160	30Hz	8 Bit	Not all 4K displays have this
HDMI 2.0	1	3840x2160*	60Hz*	10 Bit*	*TBD: Standard not yet released.
DisplayPort 1.1a	1	3840x2160	30Hz	10 Bit	
DisplayPort 1.2	1	3840x2160	60Hz	10 Bit	Receiver chips (display side) not generally available.
HDMI 1.1 – 1.4a,b	4	3840x2160	60Hz	10 Bit (HDMI1.1 limited to 8 Bit)	Synchronized 4x 1920x1080 Few displays support this.
HDMI 1.1 – 1.4a,b	2	3840x2160	60Hz	8 Bit	Synchronized 2x 1920x2160 Few displays support this
DisplayPort 1.1a	4	3840x2160	60Hz	10 Bit	Synchronized 4x 1920x1080 Few displays support this.
DisplayPort 1.1a	2	3840x2160	60Hz	8 Bit	Synchronized 2x 1920x2160 Few displays support this

*"Connecting a 4K (3840 x 2160) resolution source to a 4K display typically involves some combination of HDMI and DisplayPort connections. In both cases, the version of the standard implemented is a critical factor in the display's ability to receive a 4K signal over a single connection. This table summarizes the capacity, in terms of resolution, refresh rate and color depth that the various HDMI and DisplayPort standards can support. As an alternative to single link 4k connections, some displays are able to receive a synchronized group of 2 or 4 connections in order to process and display a 4K source".*

From:	To:	Active or Passive?
DVI	HDMI	Passive
HDMI	DVI	Passive
DVI or HDMI	DisplayPort	Active
DisplayPort	DVI or HDMI	Passive
SDI	HDMI	Active
HDMI	SDI	Active

*“With today’s graphics cards, content servers and video processors supporting a combination of HDMI, DVI, SDI and DisplayPort outputs, it is not uncommon to have to convert one signal type to another. Luckily, there are converters available today and those choices continue to grow in the market. A key factor in a converter is whether it can be passive, in which case it will be a compact device requiring no external power, or if on the other hand it is active (or “powered”), in which case it will be larger and will require a power source and typically be more expensive. The table below outlines these converters”.*

Cable type:	Signal:	Cable length achieved*
HDMI	1920 x 1080 @ 60Hz	100 feet
HDMI	3840 x 2160 @ 30Hz or 60Hz	40 feet
DisplayPort	1920 x 1080 @ 60Hz	50 feet
DisplayPort	3840 x 2160 @ 30Hz or 60Hz	10 feet

*“Cable length is another factor. The HDMI and DisplayPort standards do not specify a maximum cable length, so testing and experimentation is required. In our experience, using good quality cables, we have been able to successfully support these distances. Extenders are available in the market for both HDMI and DisplayPort, but today there are certainly more choices available for HDMI because of its widespread use. Extenders utilizing coax, HDBaseT and fiber cabling support different run distances and are priced accordingly”.*

#### **Nielsen estimates 115.6 million TV homes in the US, up 1.2%**

The universe of US television homes is growing and so is the TV audience. According to Nielsen’s 2014 Advance National TV Household Universe Estimate, there are 115.6 million TV homes in the United States, up 1.2% from the 2012-13 estimates of 114.2 million. Nielsen estimates that 294 million persons age 2 and older live in these TV homes, an increase of 1.6% from last year. Nielsen uses US Census Bureau data and auxiliary sources such as state governments and the US postal service to arrive at Advance TV UEs in early May before the television industry’s upfronts. It then distributes final UEs before the start of each TV season. The 2014 National UEs reflect 1) real changes in population since last year; 2) updated TV penetration levels, differentially calculated for qualifying market break and age/sex demographic categories; and 3) the expansion of Nielsen’s current definition of a TV home to include homes that receive TV via broadband connection only. Nielsen applies TV penetrations to convert the total household and population estimates to TV households and persons therein. The 2014 TV penetration for US households was estimated based on data collected during the recruitment of homes for Nielsen’s People Meter panel. Nielsen’s new definition of a TV household states that homes must have at least one operable TV/monitor with the ability to deliver video via traditional means of antennae, cable set-top-box or satellite receiver and/or with a Broadband connection. <http://www.nielsen.com>

#### **ABI Research reports over-the-top video revenue grew 60% in 2012**

The increased presence of Internet-connected consumer electronics devices helped drive the over-the-top video market past the \$8 billion revenue mark internationally in 2012, a 60% year-over-year growth, according to statistics compiled by ABI Research in its “OTT and Multi-screen Services Research Service”. The continued growth of connected devices should push the market past \$20 billion by 2015, the researchers suggested, and could threaten the existing pay TV market, or at least change the way it operates. In 2012, market leaders Netflix, Hulu and Amazon.com experienced 50% year-over-year growth. The growth pattern has caught the attention of content providers and could, in the end, result in a new way of looking at the content delivery business, senior analyst Michael Inouye said in an ABI press release. <http://www.abiresearch.com>

**Rentrak reports viewing of free-on-demand TV content up 40%**

Rentrak has released its State of VoD Report 2012, which includes four years of VoD analysis from Rentrak's OnDemand Essentials service. The report shows that the total time spent viewing free-on-demand television content in the US increased by over 40% in 2012 compared to the previous year. Rapidly increasing numbers also show that the total number of free-on-demand TV programs watched went up 29% from the prior year. When considering free-on-demand programs that were aired over just broadcast networks, numbers grew more significantly, including a 60% increase in total time spent viewing and a 47% jump in the total number of programs watched since the previous year. Other insights from the Rentrak State of VoD Report 2012 include: HD VoD viewing grew by more than 60%; 43 million televisions accessed VoD content each month which was a five per cent increase from the previous year and a 13% increase from 2010. <http://www.rentrak.com>

**Alternate screens expand TV, video, audio, says comScore**

The mobile video audience has grown 282% (across smart phones and tablets) during 2012 compared to just 8% on PCs. Mobile video rose from 2 million to 14 million, compared to 32 million to 38 million on the desktop screen. comScore pointed out that people are overwhelmingly (91%) using tablets at home, typically in the living room and bedroom, hence, the rise of two-screen viewing. More than half (53%) of those surveyed by comScore said they use their tablet while watching TV, with more than half of that group (56%) doing activities related to what they are watching. When it comes to time of day, tablets are used mostly in the evening, in line with TV prime-time hours. Regardless of when and where people are using tablets, they are also the preferred device for mobile browsing and app use. People spent twice as much time on the mobile Web on iPads on average compared to iPhones, and seven times as long with apps. Looking more broadly at the digital audience across devices, comScore estimates the unduplicated audience on PCs, tablets and smart phones in the US at about 235 million. Through its new cross-platform measurement service, the company has also begun to rank digital properties based on their combined desktop Web, video and mobile audience. More mobile-centric companies like Zynga, Pandora, AccuWeather and Groupon have seen the biggest gains from the inclusion of mobile traffic. But traditional publishers -- including The New York Times and ESPN -- have also seen a boost in incremental traffic coming from mobile, at 77% and 41%, respectively. Vimeo, Hulu, Sony Online, Disney Online and Discovery saw the biggest audience gains coming from video channels. Focusing just on traffic on smart phones and tablets, Disney, Discovery, Dow Jones and The Weather Channel had the largest share coming from tablets, at about 30% each. Citing research that comScore has done in relation to sports TV content, the firm has found audiences on alternative screens are adding to the video audience rather than duplicating the TV audience. <http://www.comscore.com>

**Ooyala reports live video viewing Tops VOD**

People now tune into live video 2.5 times longer than VOD content on broadcast and entertainment networks, according to new findings from video services firm Ooyala. Compared to traditional TV, Ooyala also found distinct online viewing hours among consumers. Prime viewing hours for online broadcast content are noon on weekdays and 9 p.m. on weekends. In particular, tablet viewing spikes on weekends, when viewers spend twice as much time watching video from broadcasters online. More than 75% of time spent watching mobile video in March was with long-form content or videos longer than 10 minutes in length, Ooyala reports. Plus, nearly half of all tablet video consumption was with video at least 30 minutes in length. <http://www.ooyala.com>

**Thomson provides higher density compression**

Thomson Video Networks has introduced the latest version of its Vibe EM4000, a multichannel HD ATSC encoder. The EM4000 is capable of encoding up to eight HD or SD channels or a mix of both within a 1 RU chassis. The EM4000 encoder includes Thomson' latest MPEG-2 video compression codec and the Thomson Flexstream 2.0 built-in statistical multiplexer, which generates a multi-program transport stream and optimizes bandwidth utilization among various HD and SD programs. Offering a significant increase in compression efficiency through improved motion estimation and enriched encoding algorithms, the EM4000 delivers better use of satellite or terrestrial bandwidth, according to Thomson. Premium audio delivery is enabled by a comprehensive audio feature list with multichannel Dolby Digital compression, Dolby E decoding, and automatic loudness control. The Vibe EM4000 also supports future formats including 1080p and 3D, and it provides continuous efficiency improvements through further development of the platform. <https://www.thomson-networks.com>



### Digital TV homes to exceed 1 billion next year, says Strategy Analytics

The worldwide market for digital TV services will continue to see strong growth over the next few years and rise from 755 million households in 2012 to over 1 billion sometime next year, with digital cable to remain the dominant platform, according to Strategy Analytics. Taking a slightly longer view, the same report predicts that the worldwide DTV market will show a compound annual growth rate of 10% between 2012 and 2018, with digital satellite households (both pay and free) experiencing “significant” growth in several regions, as the total number of subscribers increases by 64% from 2012 to 2018. “Even though many countries have completed their digital transitions, there is still a lot of room for growth in digital television globally,” said Jason Blackwell at Strategy Analytics. “Perhaps surprisingly, one of the biggest growth rates over the next few years will be in digital terrestrial. Most countries will complete the digital transition by 2018 and pay digital terrestrial as well as free-to-air terrestrial services will benefit from these transitions.” The research firm also predicts that digital pay-TV revenues will grow by 45% over the same six-year period, as they typically represent higher value to the operator than analog services, with a higher base subscription fee plus higher VOD sales. <http://www.strategyanalytics.com>

### Nielsen reports mobile devices and TV creating an integrated entertainment experience

Nearly half of US smart-phone and tablet owners – 46% and 43%, respectively – said they use their devices as second screens daily while watching TV. More than 2/3 said they used their mobile devices as second viewing screens multiple times per week during 1Q 2013, indicating just how much of an impact connected mobile devices have come to have on Americans’ TV viewing habits, according to Nielsen’s latest survey of connected device owners. Seeking to find out if smart-phone and tablet owners are using these second screens as distractions or “to engage more deeply with what they’re watching,” Nielsen discovered that the answer is both. Seventy-six percent of tablet owners surveyed continued to rank Web searches and general Web browsing (68%) among the top second-screen activities, according to the latest survey. They are also using their tablets to engage in activities directly related to what they’re watching, however. Nearly half said they look up information about what they’re watching, for example. More than half the tablet and smart-phone owners surveyed said they visited a social media site while watching TV. At least 20% “spent time reading social media discussions about the program they were viewing.” Furthermore, 13% of tablet owners said they used their devices to interact with the show they were watching, and 13% said they write social media posts about these shows, many more than was the case among smart-phone owners in both cases. About 15% of tablet users said they watched a program as a result of something they read on a social media site. Smartphone users spend nine hours per month accessing social media from their mobile devices on average, Nielsen also found. Tablet owners did so an average four hours per month, according to Nielsen’s “Q1 2013 Cross-Platform Report.” In addition, 20% of tablet owners said they use their mobile devices to shop for goods and services advertised on TV, “providing advertisers another opportunity to connect with consumers.” <http://www.nielsen.com>

### Intel’s Thunderbolt2 doubles bandwidth, enabling 4K video transfer and display

Everybody seems to be sharing video these days — at higher resolutions than ever. This always-increasing demand has helped expand growth and adoption of Intel’s Thunderbolt technology in 2013, especially for the video editors creating the best and richest content. Originally brought to market in conjunction with Apple, Thunderbolt is now a standard feature of Mac computers sold in the market today. The last year has also seen the PC industry get on board in earnest, as Thunderbolt is currently included on over 30 PCs and motherboards worldwide, including on more than a dozen new 4th generation Intel Core processor-based products. In addition, there are more than 80 Thunderbolt-enabled peripheral devices, covering everything from storage drives, expansion docks, displays, and a myriad of media capture and creation hardware. More than 220 companies worldwide are developing Thunderbolt-enabled products, and that’s only going to increase, according to Intel. In April, Intel announced plans for an important advancement in Thunderbolt technology – the upcoming controller codenamed “Falcon Ridge” running at 20Gbs, a doubling the bandwidth over the original Thunderbolt. Named “Thunderbolt 2”, this next generation of the technology enables 4K video file transfer and display simultaneously. It is achieved by combining the two previously independent 10Gbs channels into one 20Gbs bi-directional channel that supports data and/or display. Current versions of Thunderbolt, although faster than other PC I/O technologies on the market today, are limited to an individual 10Gbs channel each for both data and display, less than the required



bandwidth for 4K video transfer. Also, the addition of DisplayPort 1.2 support in Thunderbolt 2 enables video streaming to a single 4K video monitor or dual QHD monitors. All of this is made possible with full backward compatibility to the same cables and connectors used with today's Thunderbolt. Professionals and enthusiasts alike will be able to create, edit, and view live 4K video streams delivered from a computer to a monitor over a single cable, while backing up the same file on an external drive, or series of drives, simultaneously along the same device daisy-chain. Backing up terabytes of data will be a question of minutes, not hours. And finally, since Thunderbolt 2 is backwards compatible, original investments in cables and connectors continue to pay off while supporting dramatically improved performance. Thunderbolt 2 is currently slated to begin production before the end of this year, and ramp into 2014. <http://blogs.intel.com>

### **A third of US households to adopt multiscreen this year according to ABI Research**

Nearly a third of US telco TV households are expected to access multiscreen or TV everywhere services by the end of 2013. Cable is close behind due to its early lead, but the growth rate for these services is slower because of the greater diversity of cable households and services (not all service providers offer TVE). According to ABI Research, satellite operators are further behind, due to slower starts and lack of in-house broadband services, but offer some novel experiences like Dish's Sling place-shifting technology. The vast majority of US TV consumers already use advanced interactive features like remote programming a DVR, the firm found. But they also need further education about TVE services, particularly to help navigate content availability and fragmented device support. "The market is still developing with many of the early growing pains, like authentication, finally starting to take a back seat to the content," commented senior analyst, Michael Inouye. "In many respects the technology is in place to increasingly offer wider reaching TVE services. Securing the rights to broader content distribution is the primary remaining hurdle, but once standard metrics are developed the content floodgates are expected to open wider." Outside of the computer, Apple's iPad continues to be the most supported TVE device in the US market. In fact, iOS and Android smart phones and tablets capture the lion's share of device support, besting even the popular game consoles. In the multiscreen and OTT space the MVPDs are moving at a relatively fast pace – rapid enough that in some instances the platforms have outpaced consumer awareness. <http://www.abiresearch.com>

### **EOCA, CEA want no limits on TV spectrum bids**

Restricting who can bid on TV stations selling spectrum could result in reduced FCC revenues and even a failed auction process. That's the warning from the Expanding Opportunities for Broadcasters Coalition and the Consumer Electronics Association. To make their case, the EOBC and CEA have released what they describe as a "data-driven analysis of FCC bidding restrictions" called 'Maximizing the Success of the Incentive Auction.' Written by Fred Campbell, former Chief of the FCC's wireless telecommunications division, this report says previous FCC bidding restrictions delayed the provision of new wireless services to 68 percent of the public by a "weighted average" of nearly seven years and lowered net auction bids on spectrum by 31 to 61 percent.

In this instance, the EOBC and CEA are aiming at the proposed auctioning of broadcast spectrum by TV stations to wireless carriers. They fear that a competition-minded FCC might restrict wireless heavyweights AT&T and Verizon from gaining too much spectrum through their bids, thus lowering auction revenues for TV broadcasters who are selling bandwidth. The EOBC/CEA report estimates that nearly \$5.8 billion in revenues could be lost if bidding restrictions are placed on 50 percent of available spectrum.

"New options are emerging for TV stations to use their existing spectrum licenses," said Preston Padden, executive director, EBOC. "To attract the critical mass of broadcasters necessary to make the auction a success, we need competitive bidding among all wireless carriers for every license and the assurance that every TV station will be fully compensated for its spectrum rights." (Note: EOBC does not release the names of its members.)

For its part, "NAB has not taken a position on spectrum aggregation limits or the recent study from the Expanding Opportunities for Broadcasters Coalition and CEA," said Zamir Ahmed, NAB's Manager of Media Relations. Speaking on background, an NAB source explained that the association's position, with respect to the auction, is to protect broadcasters who decide to stay in business and that bidding limits do not factor into this effort.



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# Quantum dots enable LCD color enhancements...

by Jeff Yurek

Jeff Yurek is the Corporate Communications Manager at Nanosys. He writes a blog (<http://dot-color.com>) about which he notes: "Because I'm in the display business, I notice a lot of confusion and loosely used definitions in the discussion of color science. I've started this blog as a way to get to the bottom of some of this stuff. My aim is to synthesize information I've accumulated in order to provide a useful way for us to understand why color is so important and exciting". Jeff has advanced degrees from Suffolk University's Sawyer School of Management, Boston University, and the Berklee College of Music.



Although AMOLED technology continues to promise great things for the future, the technology has yet to capture a large share of the overall display market. LCD remains the standard in nearly all display product categories and with good reason. With over a decade of explosive growth in manufacturing capacity by LCD makers, the cost of LCDs of all sizes is tough to beat for upstart technologies like OLED. Beyond cost, LCD has been able to match just about every feature advantage that new technologies have offered. Advancements like local dimming, in-plane switching and in-cell touch respectively brought great contrast, improved viewing angle and reduced thickness to LCDs. Outside of marketing hype, there has not yet been a strong enough case for the industry to move beyond LCD.

However, one area where LCDs have so far failed to match OLED is color performance. Today, millions of people around the world carry a mobile device in their pocket that can reproduce a wider range of color than the HDTV broadcast standard, using AMOLED display technology. Could color be the tipping point feature for OLED that finally pushes it past LCD?

LCDs have faced a practical limit in terms of color performance, at best reaching the sRGB color gamut, or about 70% of OLED's capability, because of the white LED light source used in most LCD backlights. While LCD makers have experimented with other wide gamut backlight technologies, such as discrete RGB LED and CCFL, all have proven too costly, too power hungry or too bulky to be viable. It has seemed that high brightness, portability and wide gamut color performance simply could not be had in the same LCD package at the same time.

A new class of phosphor material called quantum dots is changing the equation for LCD makers. First developed in the 1980's at Bell Labs, quantum dots have the unique ability to efficiently emit light at a single spectral peak with narrow line width creating highly saturated colors. In addition, the emission wavelength can be tuned continuously based on the size of the quantum dots. This capability enables display designers to custom engineer a spectrum of light to maximize both the efficiency and color performance of their display.

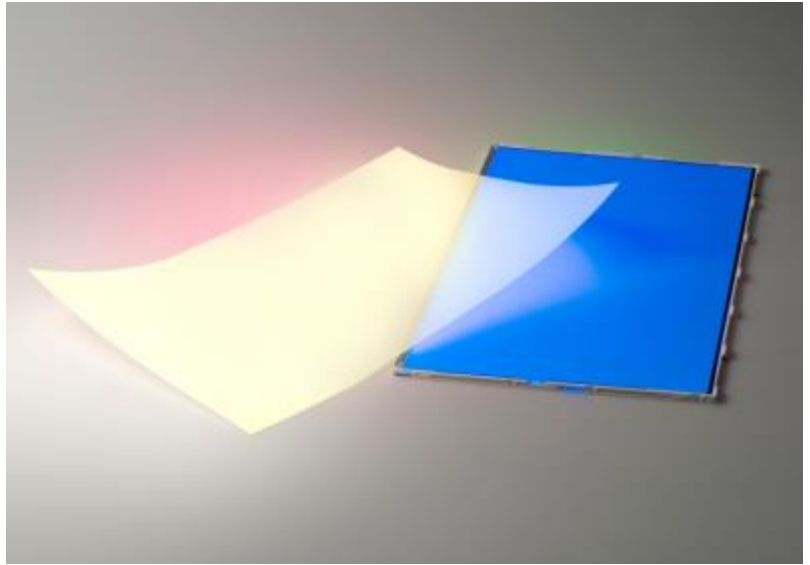
**How Quantum Dots Work:** Unlike conventional phosphor materials, quantum dots, which are just nanometers in diameter, can be fabricated to convert short-wavelength light (i.e., Ultraviolet light) to nearly any color in the visible spectrum. The spectral output of a quantum dot is determined by its size. Bigger dots emit longer wavelengths, while smaller dots emit shorter wavelengths. It's a neat trick of quantum mechanics and a phenomenon called quantum confinement that describes what happens to electrons and holes when confined in nanoscale materials. Think of a guitar string— to use a classic physics analogy— when you make a guitar string shorter, you produce a higher pitch and when you make it longer, you get a lower pitch. The tune of a quantum dot – the wavelength of the light it emits – behaves in a similar way.

Using the size-dependent emission prosperities of quantum dots, an LCD backlight spectrum can be tuned to meet exact performance goals. For example, a display maker may want to target the Adobe RGB gamut and a D65 white point for a particular device.

**Packaging QDs for existing manufacturing processes:** Quantum dots are an exciting technology, but that is not enough to drive adoption in the display industry. Manufacturers are not willing to risk altering processes they

have invested billions in to try a new, novel technology. If quantum dots are going to have an impact in the display industry, they need to be packaged into a process-ready system that is compatible with existing, standard LCD manufacturing processes. Nanosys has done this in creating its Quantum Dot Enhancement Film (QDEF) product.

*Quantum-dot enhancement film (QDEF) is designed to replace the diffuser in an LCD backlight unit (BLU) and is placed between the BLU and the LCM. The QDEF contains red- and green-emitting quantum dots that are tuned to each display system and is illuminated by blue LEDs in the BLU. In the above image, a sheet of QDEF (left) can be seen converting some of the blue light emitted by a BLU (right) into white.*



Designed to replace, although with significantly more functionality, an existing film in LCD backlights called the diffuser, QDEF combines trillions of red and green emitting quantum dots in a thin sheet that emits finely tuned white light when stimulated by blue light. Each sheet of QDEF is comprised of three layers, consisting of two plastic barrier films sandwiching a layer of quantum dots that are suspended in a polymer matrix.

The result is a simple, ready-to-use product that manufacturers can directly integrate into existing processes. By adding QDEF, they can immediately begin producing LCD panels with color and efficiency performance beyond even the best OLEDs, without making any changes to processes they have invested billions in.

*The comparison shot above shows two identical LCD HDTV panels. The set on the right has had its white LEDs replaced with blue LEDs and its diffuser replaced by a sheet of QDEF. The result is greater than 100% of NTSC color gamut with deeper, truer reds and greens.*



**Conclusion:** Quantum dots are cost-effective, process-ready, proven and efficient enough to bring wide color gamut performance to all of the screens in our lives, from the smallest mobile devices to the biggest TVs. None of the wide gamut technologies that preceded quantum dots could claim to pull all four of these critical attributes together in one package.

With the broader availability of wide color gamut hardware enabled by quantum dots, content creators can begin to take wide gamut seriously. This opens the door for Hollywood to start creating a stunning new visual experience for consumers, actually delivering a full cinematic viewing experience to our living rooms.

Color will be the next big differentiator in the increasingly competitive consumer display market. Display makers that can bring the user experience closer to reality with lifelike colors, without sacrificing efficiency or cost, will establish a dominant market position.

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# The Auto Market and TV

by Norman Hairston

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



**Introduction:** A veterinarian friend of mine once claimed that veterinary spending was a leading economic indicator. When times were turning bad, one thing that it was easy to cut back on or postpone was pet care. When times turned good, one of the first things pet owners would catch up on was pet care. In the universe of goods and services some products react more strongly to fluctuations in the economy, some react more quickly, some even react inversely. (In an earlier article, I pointed out that, in the US, TV set sales actually raise at the front end of a recession).

Although there was some resurgence in TV set sales in 2010 when it was widely believed that we were coming out of the "Great Recession" sales have languished as the recovery has sputtered along without being very much of a recovery. Predicting future set sales is difficult as the current economic situation is without precedent in the consumer electronics era. Economic models have limited reliability over the range of data from which they were constructed. They have no reliability beyond those ranges. This is one reason why the Wall street collapse was so complete; the economy ventured beyond where the Wall Street financial models were accurate and rode off a cliff. Absent a good model to forecast sales, their still remain the fundamentals such as new household creation rates, consumer sentiment etc. However, at this point, the best model of future sales would be to look for products that would lead TV set sales in recovery. Auto sales are not perfect in modeling the salient features of a TV set but the resurgence in US auto sales does provide a hopeful note that growth will once again return to the US TV set market.

**Automobiles as a Leading Indicator:** New auto sales share a number of features in common with TV set sales. Sales are tied to things such as the economy in general, household creation rates, and interest rates. Further, sales are postponable; during tough times, the replacement cycle gets extended. However, for auto sales, extension of the replacement cycle has a cost in the form of increased repair bills. And, where a TV may keep working indefinitely without any need of maintenance, at some point the maintenance cost of an aging auto make it uneconomic compared with the cost of purchasing a new vehicle. In short, while replacement sales for a TV can be infinitely postponable, that is not true for an auto. For this reason, it would be anticipated that, especially during a long recession, auto sales would turn up faster than TV sales. US auto sales have, in fact, returned to pre-collapse levels. <http://www.businessweek.com/videos/2012-05-01/pent-up-demand-driving-u-dot-s-dot-auto-sales>

Consumers are not yet making up for lost time during the 2007-2012 period, but at this point pent up demand is making up for what would be depressed sales in a continued sputtering economy. As well as autos, it would be expected that consumers are also replacing other durable goods where further postponement has an economic impact. This would include things such as other home appliances and home repair. Sales of building material dealers have surged by over 14% Y/Y and major appliance sales are up as well. Most articles discussing this sales growth don't necessarily point to a full return of the market but pointedly make reference to **pent up demand**. <http://retailsails.com/2012/04/16/retail-sales-in-u-s-increased-more-than-forecast-in-march/> So, at this point, it cannot be said that the economy has recovered for these items but that the backlog of consumer durables needing to be replaced is mostly making up for otherwise depressed sales. This isn't necessarily good news for TV sales unless you know how long it will take consumers to move from economically demanded replacements to more luxury goods such as a newer TV. Auto sales had been declining since the turn of the century, due to more



reliable product and better maintenance. However, if you take 2007's 16MM autos as a steady state (<http://www.autoobserver.com/2011/10/edmunds-sees-2012-car-sales-near-135-million.html>) then the backlog accumulated over the 2008-2011 period amounts of over one year's sales. Coupled with home repair spending and replacement of major appliances, it could very well be another couple of years before the US consumer mindset moves on to more discretionary goods. If you look at the kinds of cars that are being purchased, much of the growth is in high mileage or even totally electric vehicles. And, for the first time in a while, cars are actually outselling "light trucks". Even with new purchases, a chastened consumer is looking to reduce expenses with their new purchase rather than facilitate and increase.

**The Housing Market:** More fundamental to TV set sales is the housing market. The bulk of TV set sales are driven by replacement rates, growth in sets per household, and growth in households. Further, growth in home value, (or more correctly borrowing on the growth in home value) was a major source of consumer income over the pre-crash period. During the great recession, rather than growing, households consolidated, and net immigration to the US (another source of household growth) was choked off. This led to historically high vacancy rates for owner occupied housing and historically low housing construction rates and declining home values. According to the recently released "State of the Nation's Housing" report by the Harvard Center for Joint Housing Studies ([http://www.jchs.harvard.edu/research/state\\_nations\\_housing](http://www.jchs.harvard.edu/research/state_nations_housing)) the housing market seems to have already bottomed, with new home, particularly multi-family residences, construction picking up and rising prices. Per the study, "While still in the early innings of a housing recovery, rental markets have turned the corner, home sales are strengthening, and a floor is beginning to form under home prices. With new home inventories at record lows, unless the broader economy goes into a tailspin, stronger sales should further stabilize prices and pave the way for a pickup in single-family housing construction over the course of 2012..."

A continuing above normal vacancy rate and the coming of age of the echo boomers (children of the post WWII baby boomers) and net immigration returning to only half of previous levels "...the Joint Center for Housing Studies projects household growth should still average 1.18 million a year in 2010–20." Further, "Because the echo boomers are much more racially and ethnically diverse than previous generations, a larger share of tomorrow's young households will be minorities. Indeed, the Joint Center projects that minorities will account for more than 70 percent of net household growth in 2010–20." Minorities tend to have higher TV ownership rates.

**Conclusion:** While the US economy remains sluggish and the situation in Europe continues to offer the opportunity for unpleasant surprises, it seems that US TV set sales are already as bad as they are going to get or already on their way to improving. The recovery in housing and the coming of age of the echo boomers offer further long-term reasons for optimism. The Philips model (<http://www.veritasetvisus.com/LCDTVVA/LCDTVVA-7,%20Winter%202009.pdf> page 40) suggests that the consumer backlog in TV is mostly made up within 2-3 years from the end of a recession. Though there was something of an uptick in 2010, given the size of the backlog and the standard definition to HD transition coming during the recession period, probably there is a substantial consumer TV backlog still waiting to be realized. However that realization may be stacked behind other consumer priorities. Additionally, between now and then, even when the market starts to make up for postponed sales, the consumers' eye might be or toward value than indulgence. As TV has become more of a service than a product, options that lower the "fuel cost" of a TV might be more popular even when they increase the initial cost of a TV set. This could be pre-paid content contracts, facilitated access to free net content and/or the increased user generated content capability including things like home security. In any case, full recovery and restoration to growth of the TV set market is not likely to begin in the short term. In this period I would expect value features to continue to do well. To the extent that the industry can demonstrate value in its premium features then these premiums can do well also.

US auto sales are currently on a pace of 14.4 million, still substantially below the 16 million run rate prior to the collapse. When sales exceed the 16 million rate, when postponed sales truly do start to get realized, we might also see the backlog of US TV set sales start to be redeemed as well. Given the relatively low cost of a TV set and other fundamentals such as a presumed unwinding of household consolidation of the recession years, the market could go from its current state to very hot in a very short time. This is not going to happen any time soon and it of course depends on continued economic recovery. However, continued good news in autos and housing means that good news in the TV market is on its way.

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# Channeling the Universe

## Heading to the New Normal

by Marty Shindler

**Marty Shindler is CEO of The Shindler Perspective, Inc. a husband and wife consulting practice with a pedigree that includes a Big 4 firm and a top 5 business school, with additional experience at 20th Century Fox, MGM, Lucasfilm/Industrial Light & Magic and Kodak's Cinesite. Shindler has been involved as either a panelist or a moderator at events for The Academy of Television Arts & Sciences, SMPTE and Digital Hollywood among others, all on matters related to the business side of entertainment technology. Visit <http://www.iShindler.com> for more information.**



We are channeling the universe, literally and figuratively, working to determine what the new normal is, if even there is one, and if there is, it certainly is not one size fits all.

From the literal point of view, as the Voyager 1 space probe left our solar system a few weeks ago, the press report was that it would continue to send back signals until the year 2020. Perhaps that year was intentionally set to coincide with the 400<sup>th</sup> anniversary of the Pilgrims landing at Plymouth Rock, although probably not.

While we expect those signals to tell us “something” the fact is that when it was launched in 1977, our technology base was sophisticated enough and NASA had the foresight to put the device on board. Today, all vessels launched include cameras to beam back images of far distant worlds and the images have become as commonplace as the images we see regularly from the International Space Station.

Figuratively, we have long ago dismissed the concept of the 500 channel universe described as the “future” as recently as 20 or so years ago. In due time, we came to recognize that it was really a universe of infinite channels, broadcast and narrowcast, long before the 500 channel universe was achieved or even achievable. Many of us recognized that was the direction in which we were heading, not necessarily realizing that the “normal” might not be so normal, and not knowing when the world of infinite channels would come to be.

Only in the last couple of years has the general public accepted the concept of the infinite universe. In fact, that universe will continue to change as methods of content creation and distribution evolve and various technologies, measurement systems and user patterns continue to take hold. The concept of “normal” may become obsolete.

A number of components of the broader change are occurring, some of which may turn out to be game changers. Let's look at a few of those and attempt to project when and how they will gain enough traction “to make a difference” and reach the next generation or tipping point of changing to the new normal.

**Fiber** – The internet as we know it took off in earnest with the transition from dial up to broadband, defined as both DSL and cable. In order to truly leapfrog again, better fiber connectivity is vital, although, given the trajectory of mobile, ultimately more robust wireless spectrum is also required.

Google Fiber is presently only in a few cities. In time, this service will be rolled out to more locales, spurring competition as they seem to have done recently in Austin, the home city of AT&T, where AT&T has now announced its intention to provide higher bandwidth to its customer base, at least in Austin. Google's efforts may also prompt Verizon to resume its FiOs deployment.

Thus, to achieve true IPTV as many believe to be the “ultimate future” cloud storage and delivery of all content, especially if/when UHD or 8K content is produced, more robust broadband is required, thus a faster rollout of fiber will serve to hasten the transition from current delivery systems to IPTV.

Will it change the way we buy our TV service? It will depend in part on the ways that the streaming services evolve. If several hit it big with a sufficient number of successes in their productions, causing a substantial migration of users from their normal, then the answer is yes.

Faster speeds and in turn higher capacity may also dramatically change what we are now calling the internet of things, a time when many devices, some mundane, some not, will have sensors that transmit data, big data.

**Original content** – Throughout the history of Television, new channels that have been created have frequently started with older content and eventually transition to original fare. It occurred in the 50s with first generation networks that put vaudeville acts and radio shows on TV with some original content sprinkled in. It occurred again as cable channels began to proliferate and is continuing as the next generation networks of NetFlix, Amazon Prime, You Tube, Hulu and others become more prevalent.

When the Weather Channel, Maxim, Vanity Fair and many others begin to create original content, it is easy to observe that change is in the air. Overall, it seems that there is a wave of original thinking going on as channels attempt to not do the “same old” in their quest to attract and retain viewers.

Indeed, with the foregoing, the march to original content is proceeding seemingly more quickly than in generations past. However, in time, they, too, will learn what studios and the big traditional and cable networks already know, that content production is risky from a commercial point of view.

**Consumption of content** – Perhaps the term TV everywhere is overused. Perhaps not. Many of us watch as our time permits, unencumbered by the “norm” and the options we have available seem to be growing every day. In fact, the historical windows of “normal” content production and distribution have been changing for some time. There is no longer a rule book of the order in which professional content is released as different sequences of release have been tried and tested, a process that will continue. The goal is to attract as many eyeballs as possible, a year round and ongoing practice.

It may even be a process that is less generic and more specific to a particular genre of product or just the whim/intuition of the execs making the release decisions. Binge viewing has been in the news a lot lately, due in part to NetFlix putting House of Cards first season all online at once so that subscribers could consume the series at their own pace. This is not new and is a concept that was popularized with the advent of TV on DVD in the last decade. With whole seasons on a DVD, producers were able to reap more value from their content than was heretofore the case with VHS, thus creating the incentive to develop much more original content.

While digital tools make it easy to do, it just puts pressure on the production workflow to complete a whole season of episodes at once. No longer is there a “normal” whole season in terms of a specific number of episodes or a start and end date. On the plus side, writers have more freedom in developing their character story arcs.

**Measurement** – So far in the “new” TV season, the prevalence of the DVR is being felt more so than in years past, with some shows anticipated to increase their live viewership by 100% or more once the final counts are done. C3 and C7, measuring viewers 3 and 7 days respectively from air date, supplements the overnight Nielsen traditional measurement, becoming the new “normal.”

In the early days of the season, with a plethora of new programs entering the marketplace, it may be difficult for some to watch within the 7 day window and indeed that should not preclude advertisers from reaching their share of the viewers.

In due time, dynamic ads will be inserted in DVR stored programming. The Thursday night show that in its live delivery has an ad for “tomorrow’s” new movie release could be supplemented a month later with whatever “tomorrow’s” release will be or even just a generic consumer product ad or whatever seems to be in inventory at the time the program is ultimately viewed. Higher capacity broadband will assist in the rollout of this technology.

This season we’ll see Twitter sentiment entering the measurement arena as a part of the Nielsen ratings due primarily to the prevalence of second screens and fans Tweeting their thoughts while watching one of their favorite shows. I’ll be watching to learn about the impact and will be curious as to what occurs when someone is watching beyond the current 7 day cycle. How many Tweets in the longer time frames matter? And Facebook recently announced which shows, especially new shows, created the most chatter on its social network.

Will Twitter and Facebook provide statistically valid data as to the entire viewing universe? Probably not. But then again, the new norm may not require that, as the system provides data that is targeted, if not statistically valid. Producers and networks may use the information to cancel a show that might have been renewed based on the old measurement methodology, or they may now have sufficient information to renew a show that heretofore might not have been given enough time to find its audience base previously.

When IPTV becomes the norm, measurement will be much simpler and far more accurate. The analytics will be able to provide information far more relevant to the advertiser than is now the norm.

**TV sets** – Consumer electronics devices are undergoing rapid changes as the HD transition is essentially complete with better than 75% of US TV households now having a flat screen TV and presumably most with HD service and better than 50% of TV HH having more than one. Both percentages will continue to increase as will the “3 or more” sets per household.

Support systems and workflow for HD are in place and have been for some time. It will take time to bring 4K and 8K into the ecosystem. There are lots of pros and cons as to if/when that will occur, but that should be an easier transition than the one from standard to high definition.

It is just a few months until CES when we will be hit with a barrage of new sets and related devices, from mobile phone and tablets to a plethora of TVs, LCD, LED, OLED, UHD/4K, curved and flat to name some and that only includes what we know now, none of which may be considered the “norm” as all are viable and each represents a personal choice. There will be more come January as more vendors begin to show 8K even before 4K/UHD has even made negligible inroads.

The new normal? The new normal is that there is no new normal as we continue to channel the universe. What is on your channel?

## Past Editions of “LCD TV Matters”



You can download prior editions of “LCD TV Matters” from:

<http://www.veritasetvisus.com/lcdtva.htm>



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 IPS technology brings the best quality screen to  
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 The right choice of true brightness on your TV.

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# Big screen, little screen noise

by Andy Marken



Andy Marken is president of Marken Communications in Santa Clara, California. He has been involved in the video/illustration content and storage industry for more than 20 years. Years ago, he was instrumental in helping Philips introduce CD technology to the US. He has helped launch and educate the market regarding DVD-R and DVD-RAM. Today he is working to launch the blue laser technologies – Blu-ray and HD-DVD. Andy has also been instrumental in supporting a wide range of video and content firms including Sigma Designs, Dazzle, Pinnacle Systems, FAST, InterVideo, Ulead, and other firms in the software and hardware industries. He can be reached at <http://www.markencom.com>.

The CES (Consumer Electronic Show) 2013 highlights were the 2nd Screen, content in the Cloud, and eye-poppin' monster TVs. Of course, we're the same person who got caught up in the show buzz and swore netbooks and 3DTV were going to circle the globe. We all know how that turned out. The first was a little obvious because it followed a holiday that saw people buying every iPad they could and very respectable sales of Samsung's and Amazon's tablets. It was no wonder that anyone with an ounce of unimaginative innovation was showing their "iPad killer." That won't happen because every time they compare themselves to the leader, guess what? Right, they advertise Apple's solutions which mean the company got more advertising than necessary and didn't have to do any heavy lifting name/product placement.

**Tablet Content, Control:** iPads/tablets are the heart and soul of mobile devices. They don't eliminate thin, light notebooks (ultrabooks) and they aren't as personal as iPhones/smartphones. Ultimately (2017ish), they will be the real mobile video screens when there are things solved like bullet-proof broadband Wi-Fi, a great natural UI for content navigation, selection (you know, one controlled by voice, gesture, and eye-tracking) and universal portal for content search. For the next few years, they won't impact TV set viewing but do help augment, share, comment on the experience.

*It's true, almost everyone drags their 2<sup>nd</sup>, 3<sup>rd</sup>, whatever screen with them when they sit down to watch TV; but it isn't so they can watch two shows at once. There's a lot of personal activity and sharing that's being done with the mobile devices.*

## Tablet Activities While Watching TV

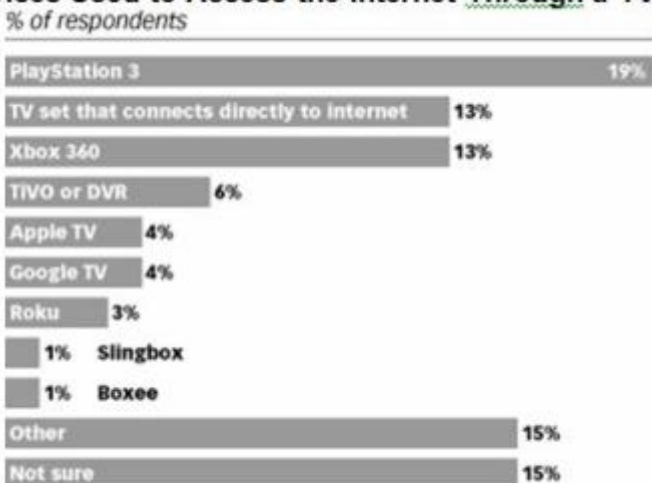


Source – GfK MRI iPanel

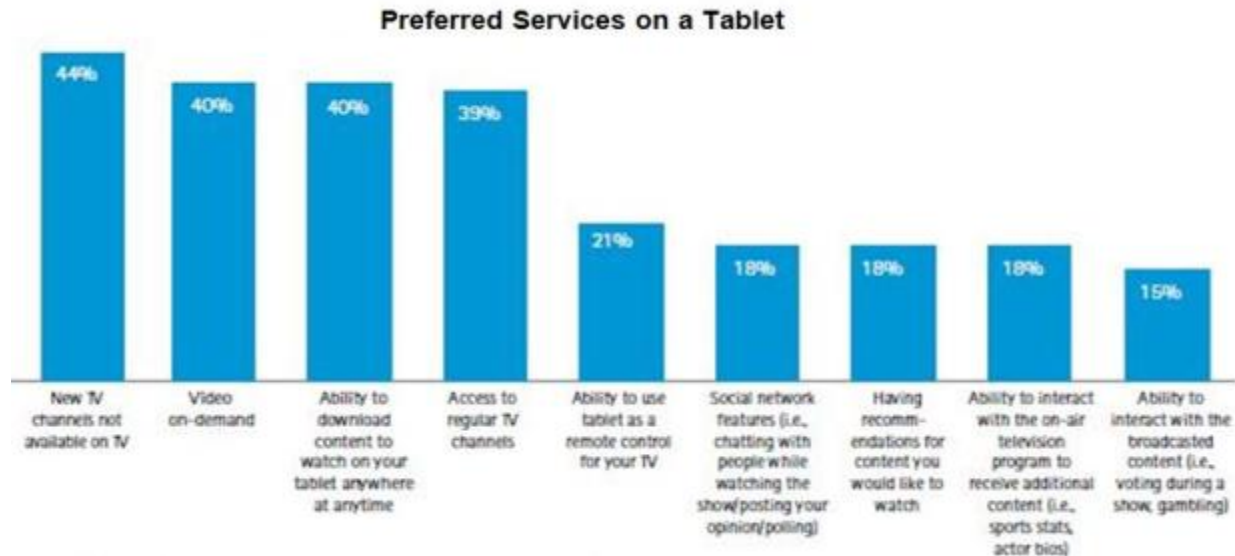
What we're going to see this year (until we can leap into the real mobile TV universe) are apps that let us use our iPad as an integral part of the TV set experience.

*Today, there are a wide range of products available that make it relatively fast and easy for TV viewers to connect their sets to the Internet. Many of the devices are also used with Smart TVs.*

## Devices Used to Access the Internet Through a TV Set



Source – Frank N. Magid Assoc.



Source – Accenture

*Everyone in the family likes his/her iPad/tablet; but they also would like to be able to do more, access more with their device in addition to using it as a remote control or online contact/discussion device.*

Content in the cloud is a hope, dream, wish for almost everyone and Marty Lafferty, CEO of DCIA (Distributed Computing Industry Assn.) gave us an excellent view of what it is going to be like when we cut the cord. There's a growing number of Internet users who are taking advantage of today's Internet-connected TVs and their mobile devices – notebooks, tablets, smartphones – for viewing their content. But the big connection device winners here are the game consoles – PS3 and Xbox 360. Suddenly, our years of using our Atari systems now can sit proudly by our flat screen TV instead of being hidden whenever guests come over. Now it's not just a game system but a multimedia entertainment device!

While Roku, the game console folks, Lafferty and others like to fan the flames under the cable folks' behinds by saying how mobs of folks are cutting the cord; it's more like cord shaving – downgrading the level of service. It's true that "everyone" is interested in cord-cutting, but interest isn't action. Millennials are more likely to cut the cord and the average age of internet-only households in the U.S. is lower than the overall average.

But it isn't all about watching free stuff online because online video consumers are rapidly learning there's a whole wide range of content available and the idea of being able to watch what you want, when you want is very appealing in our overstuffed, multitasking lives. Cisco and Alcatel both see content stressing the residential broadband networks, which is much less of an issue in other parts of the world that aren't living with old-fashioned legacy technology.

- Bell Labs estimates that by 2020, consumers in the US alone will access seven hours of video each day – as opposed to 4.8 hours today.
- There's a dramatic shift from broadcast content to video-on-demand services, which they project will increase from 33 percent daily viewing to 70 percent by 2020.
- That's a twelve-fold increase in Internet video content as cloud services, news sites and social networking applications become more video based and continuously accessible.

Alcatel also reported that:

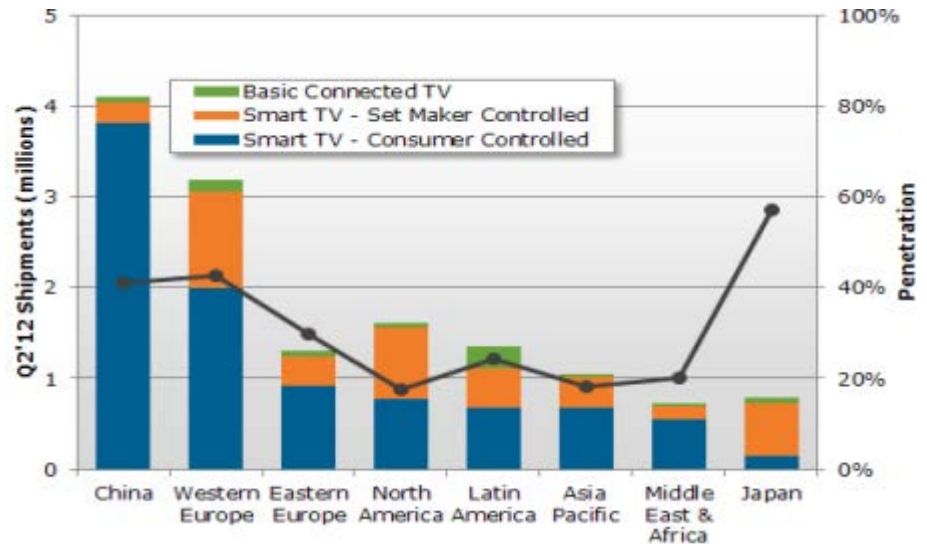
- The proportion of time spent watching managed video-on-demand services and web-based video (OTT' – providers) will come at the expense of traditional broadcast TV services, whose relative share of time will drop from 66 per cent to 10 per cent
- Internet-based video consumption each year will grow twelvefold, from 90 Exabytes to 1.1 Zettabytes
- Consumption of managed video-on-demand vs. OTT will grow at a 28 per cent annual rate, from 44 Exabytes to 244 Exabytes



- 10.5 per cent of managed video consumption and 8.5 per cent of OTT video consumption will occur at the peak hour, 8:00 p.m.

That's all great news for all of those firms showing and selling the new smart TVs we saw at CES. Worldwide sales of Smart TVs are projected to skyrocket over the next five years, with experts predicting some 220 million devices to be snapped up by 2017. Of course, Informa reported that as many as 50 percent of the sets will have been bought for viewing rather than smart features; and folks will continue connecting with Roku units, game consoles and other solutions.

*Industry analysts are right when they say there was a strong demand (at a price) for Smart TV sets this past year and forecasts look good for 2013. For the next few years though, people will quickly tire of using their Internet-connected capability because seamless connectivity is still a work in progress. Source: DisplaySearch*



Given the pace of change, that is to be expected. Look at the new apps/services – Skype, the BBC iPlayer, OnLive, HBO Go and NOW TV. Then too, the set manufacturers are all using different “unique/special” standards so developers have to pick the platforms they want to invest in/support. It would be really nice if the manufacturers agreed on a single platform so you could enjoy the stuff on your set in the family room, den, kid's room, bedroom; but gee, where's the competitive advantage in that?

**The Main Screen:** As with every CES, bigger screens grabbed all the eyeballs, and this year all of the oohhss and aahhss went to Sharp's mind-blowing 90-in screen.

*The Sharp 90-in. Smart, 3D-ready TV set was impressive from across the room – way across the room – but other than bragging rights, it didn't do much to help the company move many TV sets profitably. Except for a few of the players, the market is so unprofitable they are quietly, slowly leaving the field.*

The Sharp (obviously smart) TV was spectacular and had a price to match - \$10K plus! The price will come down as volumes go up, but so what? You realize the optimum viewing distance is 20 ft! Closer and the pixel resolution looked like a mass of zits. The distortion field folks were out in droves again this year, hawking their Smart Ultra HD 46-in (distance 9.5 ft) and 55-in (distance 11.5 ft) sets.



The only problems were: 

- No one really uses the online smart capabilities and those who do quickly tire of them and use the mobile devices they brought into the room
- There's no Ultra HD (used to be called 4K) stuff anywhere but at the theater, and no one is the first to raise their hand because they just paid off their HD equipment and their 3D hardware is gathering dust

The hottest whisper at CES was about the big Apple TV Screen. You know, the idea Cook called “an area of intense interest.” Well, the whispers were that it would be:

- Backroom-ready to show to a few folks at CES (It’s not that Apple way)
- Unveiled at Macworld (really they walked away from that withering event years ago)
- Unveiled at their own event in March (doubtful)
- In the 46-55-in diagonal range (obviously)
- Priced in the proverbial arm/leg range (sure, no one else can get away with it but ...)

Until the online content silos collapse and there are tons of universal smart apps, HD and beyond content available, it’s no reason folks are letting their Smart sets stay dumb and are using their mobile devices for...everything else. The TV set market is a losing proposition except for folks like LG, Samsung, and Vizio.



**IMPROVE** the products and functions of LCD TV products by inventing and promoting new specifications that benefit the whole industry, such as an industry-wide 'Green TV' program. There are many activities that will benefit our members from early compliance and the associated PR. The emphasis is on perceived value for little or no cost and use this to promote the industry via positive reviews and branding. The founder's experience ensures that these programs will not add cost, but rather help to relieve the relentless pressures on margin for the manufacturer.

# Tablet Display Technology Shoot-Out

**Smartphones and Tablets represent a new class of displays with requirements different from that of TVs and monitors. Here is where manufacturers are – and are not – meeting the challenges of ambient light and other considerations. This article was first published in SID's monthly magazine, Information Display.**

by Raymond Soneira

Dr. Raymond Soneira is the founder, president and CEO of DisplayMate Technologies Corporation. He has a Ph.D. in Physics from Princeton University, where he spent five years as a long-term member of the Institute for Advanced Study. A detailed biography can be viewed at: <http://www.linkedin.com/in/raysoneira>. He has authored more than 35 research articles in scientific journals on physics and computer science, many of which can be viewed at: <http://www.displaymate.com>.



Smartphones and tablets represent a major product revolution for consumers, but these mobile devices have had an even greater impact on the display industry. Up until recently, most display technology was dedicated to producing large AC-powered TVs and computer monitors that are used almost exclusively indoors under controlled and often subdued ambient lighting. Laptops are the original mobile displays, but they have hefty batteries, often run on AC power, and are also used indoors under controlled and subdued ambient lighting.

Enter smartphones and their bigger cousins, the tablets, as the first truly mobile displays. They are essentially handheld screens operating primarily on battery power that are designed for the convenient viewing of content and images virtually anywhere. More importantly, they are often used under relatively high ambient lighting and with screens that are typically oriented anywhere from 45° to entirely horizontal (as when resting on a table). These angles typically catch and reflect substantially more light than the vertically oriented screens of TVs, monitors, and laptops. Because they are carried around everywhere, these devices are also much more vulnerable to breakage, so they almost always come with a hefty cover glass, which further complicates reflections from ambient lighting.

In addition to being mobile computers that produce high-resolution text and graphics, these devices are also mobile HDTVs and photo viewers. They are expected to deliver excellent picture quality and color accuracy over a wide range of ambient lighting. Their onboard digital cameras and their frequent use for photo sharing among family and friends make picture quality and color accuracy much more important than for HDTVs because the viewers often know what the photo subject matter actually looks like, especially when the photos are viewed on a large tablet screen moments after being taken.

Last, but definitely not least, the displays are used at relatively close viewing distances, typically less than 15 in. Given their small screen sizes and high pixel resolutions, they require very high pixel densities, starting from around 125 up to the latest 450+ pixels per inch (ppi) displays. Compare this to a 50-in. 1920 x 1080 HDTV, which has just 44 ppi. In terms of the more physically relevant area density, pixels per square inch, that is up by a factor of 100:1 – very impressive!

The above represents an incredibly tough and comprehensive set of requirements for any display to deliver. While much has been accomplished in just a few years, there is still much more that needs to be done. In this article, I will use an extensive set of lab tests and measurements on a number of cutting-edge displays and display technologies to see how they are meeting these challenges. I will also suggest areas and paths for improvement in future mobile displays.

**Tablet Displays and Display Technologies:** The line between smartphones and tablets has become increasingly blurred, which has given rise to an intermediate category called phablets. For this article, I am classifying any mobile display with a 5.5 in. or greater screen diagonal as a tablet. I picked a representative set of high-end displays and display technologies in this size class, with the additional requirement that they had to be tested on a production class device (rather than as a standalone display or prototype). Four tablet displays were tested and analyzed in-depth, plus many others are mentioned where appropriate. Here they are:

**OLED Displays and Technology:** While most mobile displays are still LCD based, OLEDs have been capturing a rapidly increasing share of the mobile-display market. The technology is still very new, with the Google Nexus One smartphone, launched in January 2010, as the first OLED display product that received widespread notoriety. In a span of just a few years, this new display technology has improved at a very impressive rate, now challenging the performance of the best LCDs. Virtually all of the OLED displays used in current mobile devices are being produced by Samsung Display. Here, I test the Samsung Galaxy Note II, a 5.5-in. 1280x 720 RGB OLED tablet, which is the largest OLED tablet display currently available. Samsung had previously offered a Galaxy Tab 7.7-in. RGB OLED tablet – so larger screens are likely again in the near future. On the high-resolution side, the recently released Galaxy S4 smartphone has a 1920 x 1080 5-in. 441-ppi PenTile OLED display, which will undoubtedly be extrapolated into the next generation of OLED tablets.

**LCDs and Technology:** LCDs encompass a broad range of technologies. While some tablets have launched with lower-performance twisted-nematic (TN) LCDs, most successful tablets now use higher-performance LCDs, often with in plane switching (IPS), fringe field switching (FFS), or plane-to-line switching (PLS).

- **400+ ppi LCDs:** Apple started a major revolution in display marketing by introducing its “Retina Display” in 2010, having 326 ppi on the iPhone 4. While the display is not actually equivalent to the resolution of the human retina, people with 20/20 vision cannot resolve the individual pixels when the Retina Display is held at normal viewing distances of 10.5 in. or more. The introduction of the Retina Display made it clear that displays were no longer commodities but rather an important sales and marketing feature for mobile devices. The iPhone 4 also started a ppi and megapixel war similar to what happened with smartphone digital cameras, which are still experiencing an ongoing wild goose chase heading into the stratosphere. Hopefully, the same sort of competition will not occur with mobile displays.
- The real question is how high do we need to go before reaching a practical visual ppi limit? That is a topic that I will analyze in detail in a future article. However, a new generation of 400+ ppi displays is already here, driven by the desire of many manufacturers to produce a full-HD 1920x 080 display in a phablet screen size. In 2012, HTC introduced its Butterfly/Droid DNA smartphone with a 1920x1080 5.0-in. 440-ppi display manufactured by Sharp that uses continuous grain silicon (CGS) rather than amorphous silicon (a-Si), which becomes increasingly inefficient at high pixel densities. Similarly, LG introduced its Optimus G Pro phablet with a 1920x1080 5.5-in. 403-ppi display that uses low-temperature polysilicon (LTPS), which I test here.
- **7-in. LCDs:** The now very popular 7-in. tablet format was pioneered by the Barnes & Noble Nook Color, Amazon Kindle Fire, and Google Nexus 7. The latter two tablets had 1280 x 800 displays in 2012. After dismissing the smaller 7-in. tablets, Apple subsequently introduced its own iPad mini, with a 7.9-in. 1024 x 768 display with a (surprisingly) lower performance and a much smaller color gamut and higher reflectance than both the Nexus 7 and Kindle Fire. The Google Nexus 7 was tested as a representative of the 7-in. tablets.
- **10-in. High-Resolution LCDs:** Apple started the tablet revolution in 2010 with the iPad, a 9.7-in. 1024x768 132-ppi display. It had a high-quality IPS/FFS display. Following the revolutionary iPhone 4’s 326-ppi Retina Display, Apple introduced a third-generation iPad in 2012 with a 2048x1536 264-ppi Retina Display. There have been lots of competing 10-in. tablets, first typically with 1280x800 displays and then later with 1920x1080 and above displays. The Google Nexus 10 is the iPad’s current closest display competitor with a 10.1-in. 2560x1600 IPS/FFS display. For the large 10-in. high-resolution tablets, I will test the Apple Retina Display iPad.

**Reflective Displays and Technology:** A number of reflective tablet display technologies have been under long-term development, including E Ink’s electrophoretic displays, Qualcomm’s mirasol, Amazon’s Liquavista, and Pixel Qi. The only one to reach a significant production stage so far has been E Ink, including its 6–10-in. Pearl monochrome and Triton color displays. Here, I will test E Ink’s 8-in. 800 x 600 Triton II color tablet in the High Ambient Light section below.

**Display Properties and Display Marketing:** The tablets are compared in Table 1, which lists their product specifications and display properties. While this article provides objective technical data and analysis of the

displays, it is important to understand that all of these products are configured by marketing requirements designed to get the attention of consumers by appealing to their interests, preferences, and biases, and in some cases to their lack of technical knowledge.

Categories	Samsung Galaxy Note II	LG Optimus G Pro	Google Nexus 7	Apple iPad Retina Display
Display Technology	OLED RGB Stripe	LCD IPS LTPS	LCD FFS aSi	LCD IPS / FFS aSi
Display Manufacturer	Samsung Display	LG Display	Hydis	Multiple
Screen Diagonal (in.)	5.5	5.5	7.0	9.7
Screen Area (sq. in.)	12.9	12.9	22.0	45.2
Screen Aspect Ratio	16:9 = 1.78	16:9 = 1.78	16:10 = 1.60	4:3 = 1.33
Display Resolution	1280 x 720	1920 x 1080	1280 x 800	2048 x 1536
Pixels per Inch (ppi)	267	403	216	264
20/20 Vision Viewing Distance where Pixels are Not Resolved (in.)	12.9	8.5	15.9	13.0

**Table 1:** Four tablets representing different display technologies are compared in terms of their display specifications and properties

**Color Gamut:** The color gamut is the range of colors that a display can produce. In some cases, color management is used to adjust the display's native color gamut in order to better match an industry-standard gamut. I am bewildered that the display industry is still widely using as a reference the NTSC color gamut, which was defined in 1953 and has been obsolete for over 30 years. This confusion spills over from display manufacturers, to device manufacturers, to journalists and consumers, who frequently quote and evaluate the color gamut in terms of the totally irrelevant NTSC gamut.

What is the relevant color gamut? Essentially all current consumer image content is created using the sRGB and ITU-R BT.709 (Rec.709) standards. This encompasses digital cameras, HDTVs, the Internet, and computer content, including virtually all photos and videos. Note that standard consumer content does not include colors outside of the standard sRGB/Rec.709 gamut, so a display with a wider color gamut cannot show colors that are not in the original and only produce inaccurate exaggerated on-screen colors. The color accuracy of the images produced by a tablet will depend on how closely the display reproduces the colors of the sRGB/Rec.709 color space in both hue and saturation.

Below, Table 2 lists and Figure 1 shows the measured color gamuts for the tested displays together with the sRGB/Rec.709 standard. Note that they are plotted on a CIE 1976 uniform chromaticity diagram [rather than the non-uniform 1931 CIE diagram that is still (surprisingly) being used]. The color gamuts were measured in a perfectly dark lab. In a later section, I will examine how the color gamut changes with the ambient light level.

Categories	Samsung Galaxy Note II	LG Optimus G Pro	Google Nexus 7	Apple iPad Retina Display
<b>Brightness and Contrast</b>				
Maximum Luminance (cd/m <sup>2</sup> ) Full Screen Peak White	225 (Standard) 216 (Movie)	440	374	421
Peak Luminance (cd/m <sup>2</sup> ) Small-Window Peak White	289 (Standard) 273 (Movie)	440	374	421
True Black Luminance at Maximum Brightness (cd/m <sup>2</sup> )	0	0.43	0.38	0.48
Dynamic Black Luminance at Maximum Brightness (cd/m <sup>2</sup> )	0	0.31	0.32	0.48
Contrast Ratio at 0 lux Relevant for Low Ambient Light	Infinite	1027 True 1419 Dynamic	984 True 1169 Dynamic	877 True
<b>Colorimetry and Intensity Scales</b>				
Color Gamut (%) Relative to sRGB /	134 (Standard)	98	87	99

Rec.709	106 (Movie)			
White Point (K) Correlated Color Temperature	7675 (Standard) 6597 (Movie)	8427	6714	7085
Intensity Scale Gamma	2.58	2.28–2.56	1.95–2.14	2.20
<b>Screen Reflectance</b>				
Average Screen Reflectance (%) Light From All Directions	4.9	7.7	5.9	7.7
Specular Mirror Reflectance (%) Percentage of Light Reflected	6.4	10.1	7.2	9.9
Contrast Rating for High Ambient Light	46–59 (Standard) 44–56 (Movie)	57	63	55
<b>Variation with Vertical Viewing Angle</b>				
White Luminance at 30° Compared to 0° (%)	78	41	44	43
True Black at 30° at Maximum Brightness (cd/m <sup>2</sup> )	0	0.31	0.24	0.35
Dynamic Black at 30° at Maximum Brightness (cd/m <sup>2</sup> )	0	0.22	0.20	0.35
Contrast Ratio at 30° Relevant for Low Ambient Light	Infinite	582 True 820 Dynamic	686 True 823 Dynamic	526 True

**Table 2:** Four tablets representing different display technologies are compared in terms of lab measurements in absolute darkness at 0 lux

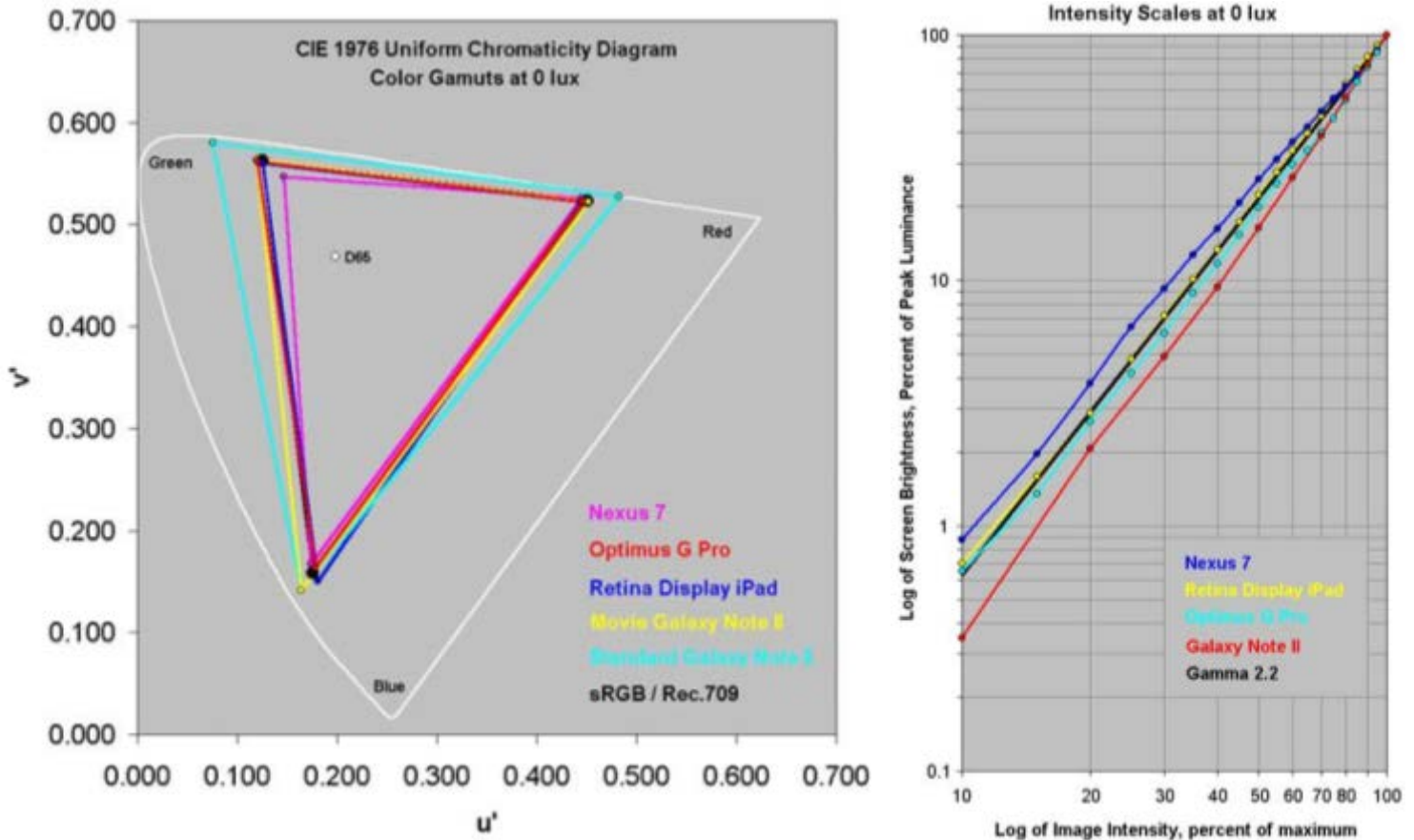
LCDs have had a difficult time reproducing the full sRGB/Rec.709 color gamut as a result of spectral light efficiency issues that decrease the luminance and power efficiency of the display when the color saturation is increased. Most mobile LCDs (including the iPad mini and Microsoft Surface RT) until recently delivered only 55–65% of the sRGB/Rec.709 color gamut, but many newer tablets are producing 80–100% of the standard gamut, including the Google Nexus 7, LG Optimus G Pro, and Apple Retina Display iPad tested here, the latter two with close to a perfect 100% gamut (in the dark). Quantum dots, which can efficiently increase the display color gamut, are beginning to appear on LCDs from smartphones up to HDTVs. A large color gamut also provides an important advantage when displays are viewed in high ambient lighting, which I will discuss below.

OLEDs currently have the opposite problem of traditional LCDs, too large a native color gamut, which requires color management in order to deliver accurate sRGB/Rec.709 colors. The resulting color mixtures require more display power and processing power to produce. The Samsung Galaxy Note II has four display modes with different color gamuts and white points – here I test the Standard and Movie modes; the latter provides a closer match to sRGB/Rec.709.

**Luminance and Intensity Scales:** The intensity scale (sometimes called the gray scale) not only controls the image contrast within all displayed images, but also how the red, green, and blue primary colors mix to produce all of the on-screen colors. The steeper the intensity scale, the greater the image contrast and the higher the saturation for displayed color mixtures. So, if the intensity scale does not follow the standard then the colors and intensities will be wrong everywhere. The intensity scales for many standards, including sRGB/Rec.709, follow a power law with a gamma exponent of 2.2. While many displays get sloppy or creative with their intensity scales, maintaining a power law (a straight line on a log–log graph) is extremely important because that preserves the red, green, and blue luminance ratios, and therefore the hues and saturation values for color mixtures regardless of signal level. Gamma values higher than 2.2 can be used to increase image contrast and color saturation, which is helpful when the color gamut is too small.

Table 2 includes measurements of the peak white luminance, white-point correlated color temperature, black luminance, and contrast ratio (in the dark). Some displays make some of these values variable (often called dynamic) in order to reduce power consumption or for an exaggerated visual effect. For LCDs, a dynamic black is

implemented by dimming the backlight for low average picture levels (APLs). For OLEDs, the luminance is typically reduced for high APLs. LCDs are currently significantly brighter and OLEDs have perfect blacks. However, because the LCDs have contrast ratios of around 1000:1, their black luminance decreases proportionally with the screen brightness setting, so their non-perfect blacks will be satisfactory for most content under most ambient-light viewing conditions. Nonetheless, the OLED perfect blacks appear stunning for applications with significant black or dark content at low ambient light levels. In a later section, I will discuss what happens at higher ambient light levels.



**Figure 1:** The color gamuts of the displays in absolute darkness 0 lux were measured using a spectroradiometer and plotted on a CIE 1976 Uniform Chromaticity Diagram. The outermost white curve represents the limit of human color vision. A given display can only reproduce the colors that lie inside of the triangle formed by its primary colors. The black circles identify the sRGB/Rec.709 Standard Color Gamut. Note that the black lines connecting the black circles are obscured by the individual display gamuts. The Galaxy Note II was measured both in its native Standard Mode and a color managed Movie Mode. D65 is the standard white point.

**Figure 2:** The measured intensity scales of the displays in absolute darkness 0 lux are plotted as the log of screen brightness versus the log of the signal image intensity. The standard power-law gamma of 2.2 is the straight black line. The Retina Display iPad has a virtually perfect intensity scale; the other displays are either somewhat too steep or too shallow, which affects the image contrast in addition to the hue and saturation of color mixtures.

Figure 2 shows the intensity scales, which were measured in a perfectly dark lab. The Retina Display iPad has a virtually perfect intensity scale. The Galaxy Note II (both Standard and Movie modes) has a fairly straight but much too steep intensity scale, while the Optimus G Pro and Nexus 7 have somewhat irregular intensity scales. In a later section, I will examine how the intensity scales change with the ambient light level.

Tablets (and smartphones) generally only provide one user adjustable parameter for the display – a brightness control. But differing user preferences and various applications would significantly benefit from providing additional

display color and image contrast controls that would allow the user to better customize the display. One interesting technical development is that OLED displays use digital pulse width modulation to produce their intensity scales and the red, green, and blue luminance levels. This makes it possible for them to precisely vary and digitally control the intensity scales, gamma values, white points, color calibration, and management of the display in firmware or software. Many OLEDs, including the Samsung Galaxy Note II tested here, have started to take advantage of this functionality by providing several display modes with different color gamuts and white points. I hope to see this extended in future OLED products. LCDs, on the other hand, are non-linear analog devices, so accurately varying or changing their many calibration parameters is more difficult. It can be done, but requires different hardware configurations and additional factory calibration. However, the functional benefits together with its marketing features and advantages make this worthwhile.

**Viewing-Angle Performance:** While tablets are used mostly as single-viewer devices, the variation in display performance with viewing angle is still very important because single viewers frequently hold a display at a variety of vertical viewing angles. When the display is lying on a table, the vertical viewing angle is typically 45° or more.

For LCDs, the typical 176+° advertised viewing-angle specification is misleading because it is defined for the angle where the (0-lux absolute darkness) contrast ratio falls to a miniscule 10, which is typically 1% of the contrast ratio for viewing at 0°. This highly exaggerated specification also makes it close to impossible for any new display technology (including LCD) that offers better viewing-angle performance to convey this to prospective investors, customers, and consumers.

Table 2 lists the variation in peak luminance, black luminance, and contrast ratio for a modest 30° vertical viewing angle. Note that the horizontal viewing-angle performance for multiple side-by-side viewers or for viewing at azimuth angles other than purely horizontal or vertical are often different. LCDs typically show a large 55% decrease in peak luminance at 30°. However, IPS/FFS LCDs show no visible color shifts with viewing angle, typically less than 2 JNCD (Just Noticeable Color Difference) at 30°. On the other hand, OLEDs show a much smaller 20% decrease in luminance, but a somewhat larger (but not objectionable) color shift that is due to anti-reflection and other optical elements.

**Screen Reflectance:** Virtually all smartphone and tablet screens can function as mirrors good enough to use for personal grooming – but that is a really bad feature, especially for tablets because their larger screens can not only reflect the viewer's face but also a wide range of objects that are behind the viewer. The reflections become obvious if you observe the tablet with the display turned off. When the display is on, those reflections are still there and wash out the image contrast and colors. In bright ambient lighting, the screen may be impossible to read without the user reorienting himself or the tablet. An additional problem with mirror (specular) reflections is that the eye automatically and involuntarily tries to focus on the more distant reflected objects instead of the screen, which is much closer. That continual refocusing can cause eye strain and fatigue.

While some HDTVs, computer monitors, and laptops have an anti-glare matte or haze finish that diffuses specular reflections, virtually all tablets and smartphones have a glossy mirror finish. One reason could be the manufacturing cost, another could be just to continue with traditional glossy cover glass designs, but it might also be that some consumers may shy away from the appearance of the hazy matte finish on such screens. In general, the matte and haze finishes improve overall screen visibility most of the time, but they will sometimes reflect ambient light that would not be seen with a specular mirror surface. I will explore this issue in detail in a future article. I hope that we will soon see more tablets and smartphones with an anti-glare cover glass rather than relying on aftermarket products that do not perform as well.

Lowering the screen reflectance is extremely important because reducing it by, for example, 10% allows the display to run with 10% less luminance and power at high ambient lighting, while still providing equivalent screen visibility. While lowering the reflectance comes with an additional manufacturing cost, it can produce a significant improvement in screen visibility and battery running time.

Table 2 includes both the specular and average reflectance for the tablets. The specular value was measured by bouncing a narrow highly collimated beam of light off the screen and the average reflectance was measured by



placing each tablet inside a large integrating hemisphere and taking measurements through a small opening near the top. The best mobile displays now show average reflectance values of 4.5%, which is a substantial improvement over the 20+% values I measured in 2006. The higher reflectance values for the LG Optimus G Pro and Apple iPad Retina Display result from an air gap between the cover glass and the display. A version of the LG Optimus without the air gap arrived too late to be included in these tests.

**Display Performance in Ambient Light:** Displays are almost always lab tested in the dark, but they are never used in the dark. In fact, tablets are often used in very bright ambient lighting, which can significantly degrade their image and picture quality. All of the earlier lab measurements were made in the dark, so in this section I repeat the measurements for a number of different ambient light levels to see how the performance changes (degrades).

The popular and often quoted contrast ratio is valid only in the dark and relevant only at very low ambient light levels. For higher ambient light levels, I have defined a “Contrast Rating for High Ambient Light” listed in Table 2, which is the ratio of peak white luminance divided by the average screen reflectance in percent. It is effectively a signal-to-noise ratio that provides a visual figure of merit for displays in high ambient light. This simple metric accurately evaluates high-ambient-light display performance and also demonstrates how luminance and reflectance offset each other. Note that smartphones currently perform much better than tablets on this.

To make the high-ambient light measurements, I placed the tablets inside a large integrating hemisphere with a bright light source that produces a uniform isotropic light distribution. A small opening near the top of the hemisphere is used to make the spectro-radiometer measurements and screen shots. I can set the illuminance to any value between 0 and 60,000 lux, which is half the value of direct sunlight at noon during the summer months at middle latitudes. I repeated various measurements at 125 lux, which corresponds to dim residential lighting, 500 lux, which corresponds to typical office lighting, 1000 lux, which corresponds to very bright indoor lighting or outdoor lighting with an overcast sky, and 2000 lux, which corresponds to typical outdoor daylight in heavy shade. The screen shots were also done at 20,000 lux, which corresponds to full daylight not in direct sunlight.

Table 3 lists the measured luminance, contrast ratio, and color gamut for the tested tablets at the indicated lux levels. Their relative performance closely follows the Contrast Rating for High Ambient Light for the tested tablets, which all (coincidentally for these tablets) have very similar values. Note that the black-level luminance is dominated by reflected ambient light even at 125 lux (but the Galaxy Note II is notably better due to a combination of low reflectance and zero native black luminance). The true contrast ratios fall from roughly 1000 or more at 0 lux, to 150 at 125 lux, to just 10 at 2000 lux.

Categories	Samsung Galaxy Note II (Standard)	LG Optimus G Pro	Google Nexus 7	Apple iPad Retina Display
Contrast Rating for High Ambient Light	59	57	63	55
White Level Luminance (cd/m <sup>2</sup> ) Small-Window Peak White	291 (at 125 lux) 297 (at 500 lux) 320 (at 2000 lux)	443 (at 125 lux) 452 (at 500 lux) 489 (at 2000 lux)	376 (at 125 lux) 383 (at 500 lux) 411 (at 2000 lux)	424 (at 125 lux) 434 (at 500 lux) 472 (at 2000 lux)
Black Level Luminance at Maximum Brightness (cd/m <sup>2</sup> ) True Black – Not Dynamic	1.9 (at 125 lux) 7.7 (at 500 lux) 30.9 (at 2000 lux)	3.4 (at 125 lux) 12.7 (at 500 lux) 49.2 (at 2000 lux)	2.7 (at 125 lux) 9.6 (at 500 lux) 37.1 (at 2000 lux)	3.7 (at 125 lux) 13.1 (at 500 lux) 51.2 (at 2000 lux)
True Contrast Ratio	153 (at 125 lux) 39 (at 500 lux) 10 (at 2000 lux)	130 (at 125 lux) 36 (at 500 lux) 10 (at 2000 lux)	139 (at 125 lux) 40 (at 500 lux) 11 (at 2000 lux)	115 (at 125 lux) 33 (at 500 lux) 9 (at 2000 lux)
Color Gamut (%) Relative to sRGB / Rec. 709	112 (at 500 lux) 93 (at 1000 lux) 69 (at 2000 lux)	77 (at 500 lux) 61 (at 1000 lux) 42 (at 2000 lux)	67 (at 500 lux) 54 (at 1000 lux) 38 (at 2000 lux)	76 (at 500 lux) 61 (at 1000 lux) 41 (at 2000 lux)

Table 3: Four tablets representing different display technologies are compared in terms of lab measurements in ambient light

**Display Measurements in Ambient Light:** Figure 3 shows the variation in color gamut with ambient light just for the Samsung Galaxy Note II. Since the color gamut decreases monotonically with increasing ambient light, there is a significant advantage to having a native gamut that is much larger than the standard gamut. This is possible for OLEDs and LCDs with quantum dots. At low ambient light levels, color management can be used to progressively reduce the gamut in order to match the standard. With color management connected to an ambient-light sensor, the display would be able to maintain an accurate visual color gamut over a wide range of ambient lighting. We will discuss this further below.

*Figure 3: The measured color gamut of the Samsung Galaxy Note II Standard Mode is shown at various ambient light levels from 0 lux (absolute darkness), 500 lux (typical office lighting), 1000 lux (very bright indoor lighting or outdoor lighting with an overcast sky), and up to 2000 lux (outdoor daylight in heavy shade) plotted on a CIE 1976 Uniform Chromaticity Diagram as in Figure 1. Note that the color gamut progressively shrinks as the ambient light level increases. This increasingly washes out the image colors.*

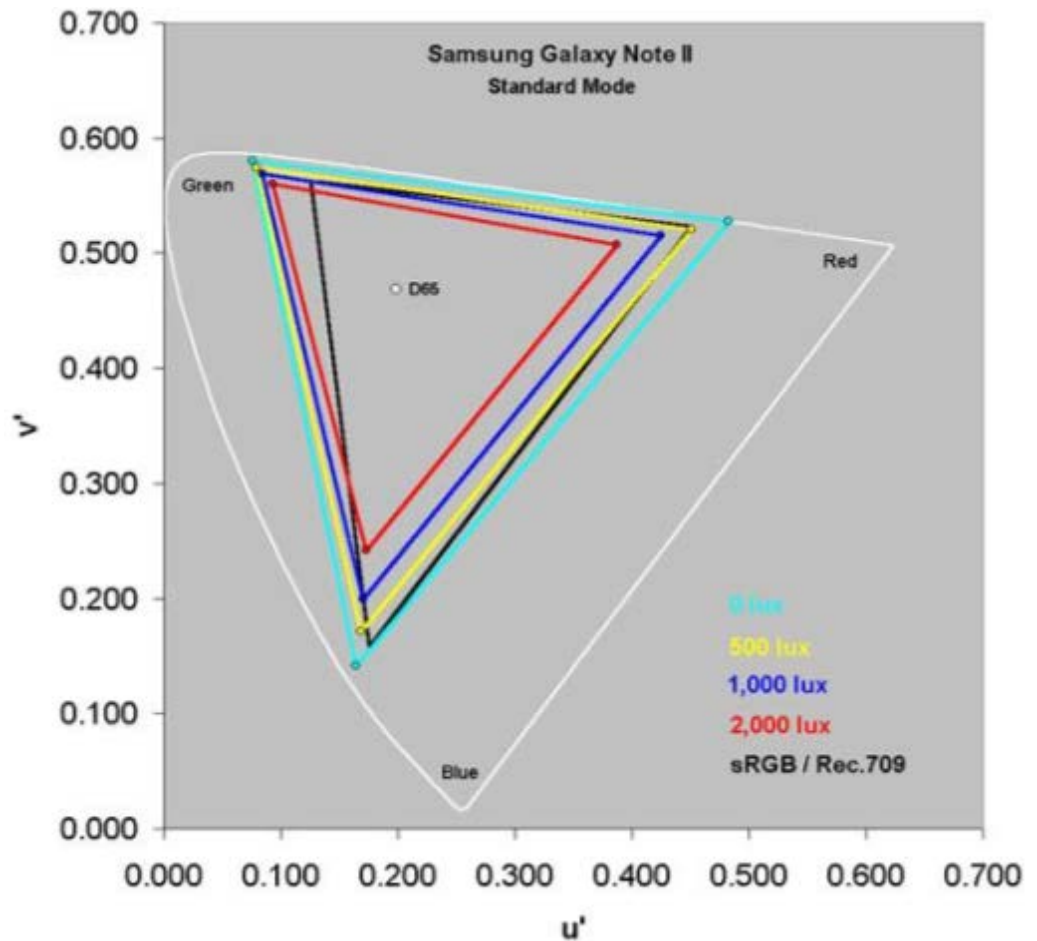


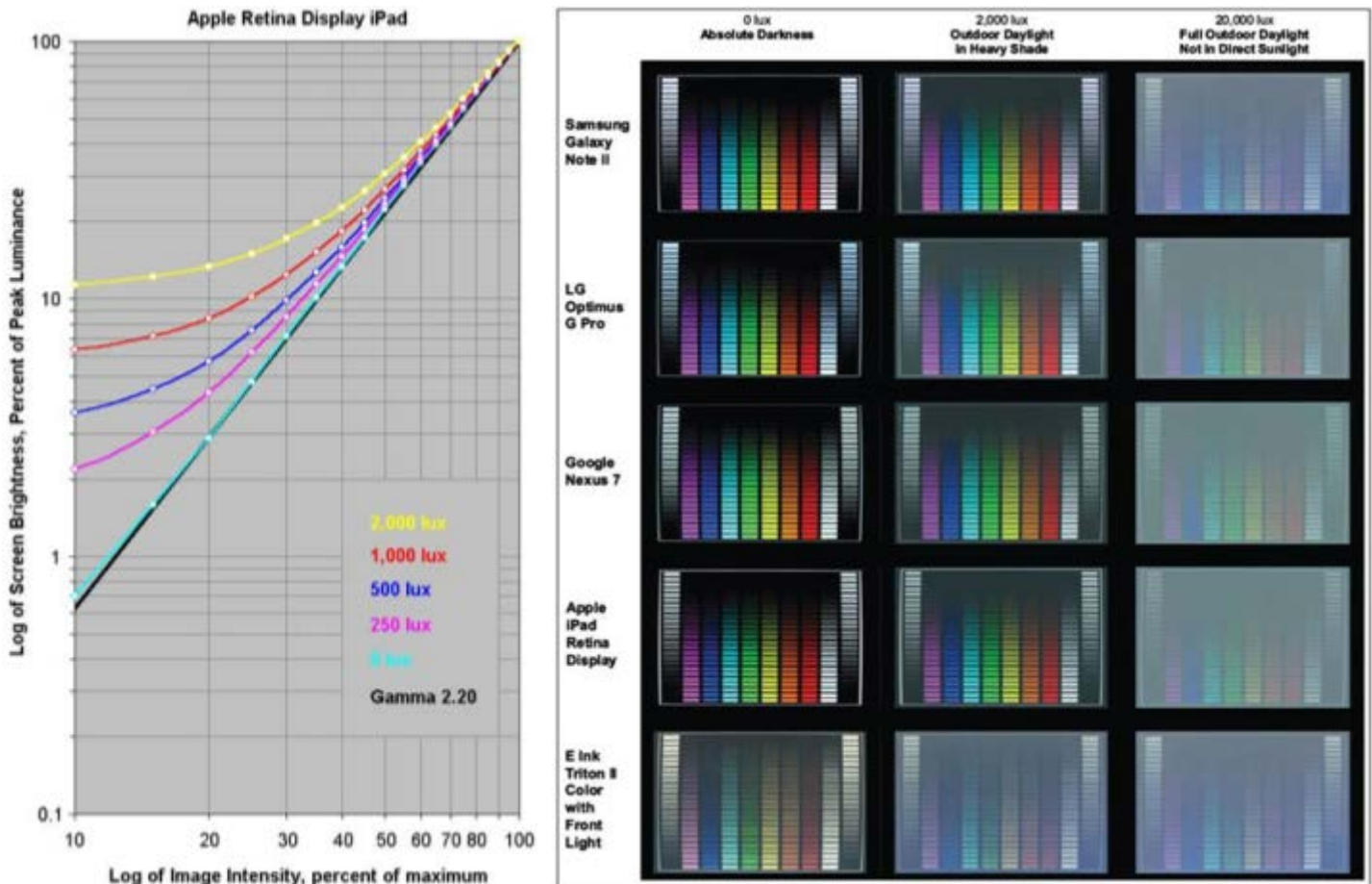
Figure 4 shows the variation in intensity scale with ambient light just for the Apple Retina Display iPad. The intensity scales flatten progressively as the ambient lighting level increases, which reduces image contrast. In order to compensate for the effect of reflected ambient light and improve the perceived visual image contrast, the display's native intensity scale should be dynamically steepened based on the ambient light level measured by the ambient-light sensor so that the composite intensity scale with reflected light still matches the standard intensity scale as far as possible. This will also improve color saturation.

Figure 5 shows screen shots of the displays with a DisplayMate Color Scales test pattern at 0, 2000, and 20,000 lux – the latter corresponds to full outdoor daylight that is not in direct sunlight. At 20,000 lux, the contrast ratios for all four tablets have decreased to roughly 2:1. I have also included the E Ink reflective electrophoretic tablet display mentioned earlier, which maintains color and image contrast independent of ambient light. While at low ambient light levels, its color saturation and image contrast are less than the other displays; at high ambient light levels, its steady performance eventually matches and then overtakes the other displays.

These are the major trends to follow in the Figure 5 screen shots above as the ambient light levels increase:

- The borders between the photos are at true black. Use them to compare the black levels in the photos. Note the progressive increase in the brightness of what is supposed to be a black background. The tablets with lower average reflectance in Table 2 have the darker backgrounds. The different color tints of the backgrounds indicate differences in the spectra of the light that is being reflected.

- Note the progressive fading and disappearance of the dimmer intensity steps. Because of the differing camera exposure levels, what matters is the number of color and gray steps that can be seen in each photo. The gray scales generally fade differently from the color scales.
- Note the progressive loss of color saturation for the different intensity steps. The tablets with higher color saturation have greater visibility at high ambient light levels.
- The reflective E Ink tablet shows the greatest number of gray-scale steps, and its color saturation is fairly constant with the ambient light level.

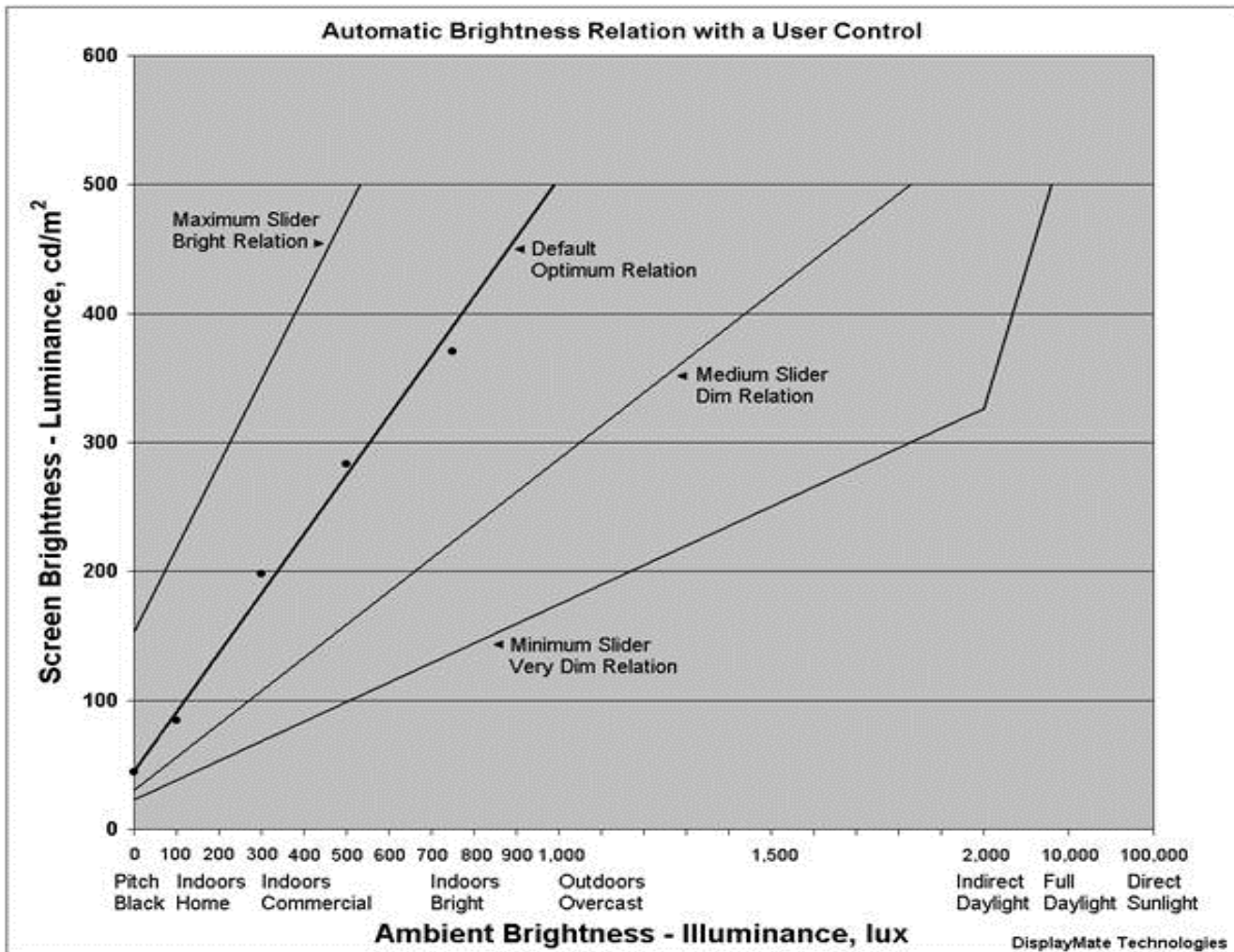


**Figure 4:** The measured intensity scale for the Apple Retina Display iPad is shown at various ambient light levels from 0 lux (absolute darkness), 250 lux (typical residential lighting), 500 lux (typical office lighting), 1000 lux (very bright indoor lighting or outdoor lighting with an overcast sky), and up to 2000 lux (outdoor daylight in heavy shade) plotted as the log of screen brightness versus the log of the signal image intensity as in Figure 2. The standard power-law Gamma of 2.2 is the straight black line. Note that the intensity scale progressively flattens as the ambient light level increases. This increasingly washes out the image contrast.

**Figure 5:** Shown are tablet screen shots in high ambient light. Because of the wide range of ambient light levels and screen reflectance values, the screen shots were taken with a camera set for automatic exposure. As a result, the exposure levels vary between the tablets, but that is also the same way that our eyes would process each image. All of the photos were taken at the display's maximum brightness setting.

**Ambient-Light Sensors and Automatic Brightness:** Automatic brightness is implemented with an ambient light sensor. Unfortunately, all of the implementations that I have tested are close to functionally useless (and many other reviewers agree), so users frequently turn them off and go back to fixed high manual brightness. It appears that automatic brightness is still primarily a marketing feature that has not yet received sufficient engineering support and actual lab testing – in most cases the automatic brightness calibration values appear to have been set semi-arbitrarily by a software programmer.

What else is wrong? The ambient-light sensor is generally installed with a narrow acceptance angle and is typically placed near the top center of the display bezel, so it winds up measuring the brightness of the viewer's face instead of the actual ambient light levels that determine the reflected glare and the surrounding light that determines the eye's adaptation level (pupil size). So, more than one sensor is needed. When the brightness changes, the very different time scales and slew rates for increasing and decreasing the screen brightness need to be set appropriately. Furthermore, most Android devices just have a simple check box for automatic brightness, with no way for the user to adjust the brightness based on visual preferences and application. Figure 6 proposes how to properly implement automatic brightness with a user control.



**Figure 6:** The test's optimum visual screen brightness settings for different ambient light levels were determined by reading a New York Times Web page on an iPhone for optimum visual comfort and readability (not too bright or too dim). The luminance and illuminance levels were measured. They are the black data points with their trend line, which is the proposed default brightness versus illuminance relationship. The other lines show a wide range of alternative brightness relationships from aggressively bright to aggressively dim with an ambient light level that should be coupled with an automatic brightness slider to allow the user to choose the relationship they want with ambient light. The graph is linear from 0 to 2000 lux and then jumps in steps to 10,000 and 100,000 lux. The labels from Pitch Black to Direct Sunlight roughly identify the lux levels associated with them.

**Suggestions for the Next Generation of Tablet Displays:** All of these tablets perform better than most HDTVs, computer monitors, and laptop displays from just a few years ago. While a lot has been accomplished, there is still much more that needs to be done. Below, I suggest areas and paths for improvement in the next generation of tablet displays. These suggestions also apply to smartphones, HDTVs, computer monitors, laptops, public signage displays, automobile displays, and just about all existing displays that are used in regular ambient lighting.



# Who ARE Those Guys?

by Pete Putman

Peter Putman is the president of ROAM Consulting L.L.C., which provides training, marketing communications, and product testing/development services to manufacturers, dealers, and end-users of displays, display interfaces, and related products. He also publishes HDTVexpert.com, a Web blog focused on 21st-century digital TV, display, interfacing, and wireless technologies, and is a regular contributor to industry trade publications including Sound & Communications, TV Technology, and Church Production. Pete received his Bachelor of Arts degree in Communications from Seton Hall University and holds a Master of Science degree in Television and Film from Syracuse University. He is a Senior Academy Instructor for the International Communications Industries Association (ICIA), and was named ICIA's Educator of the Year for 2008. He is a frequent speaker at industry trade shows and technology conferences, including InfoComm, NAB, the Hollywood Post Alliance Technology Retreat, and the SMPTE Fall Technology Conference.



A recent article on the Reuters Web site details how Chinese LCD TV manufacturers are quickly gaining ground on Korean TV heavyweights LG and Samsung – and they've used UHDTV, a barely-hatched technology, to do it. According to Reuters, (<http://www.reuters.com/article/2013/09/16/us-lcd-china-idUSBRE98F0XW20130916>), LG and Samsung were so focused on one-upping each other in the still-gestating OLED TV business that mainland brands like BOE Technology and TCL and Taiwan-based Innolux and AU Optronics managed to sneak into the party and capture significant sales of 4K UHDTV sets using conventional LCD technology.

Until last year, a paltry 33,000 UHDTV sets had been sold worldwide (200M 2K and 720p LCD TVs were sold during the same time period). But shipments of 4K TVs have since multiplied by 20 times, based on data from IHS. And the Chinese are a big reason why.

In a rare moment of candor, LG Display's CEO Han Sang-beom was quoted as saying, *"...I have to admit that we hadn't fully appreciated the potential of the UHD market. We assumed it'll be too early for this type of display to take off, and thus didn't think much of having diverse UHD product line-ups, especially in the low end. But I think we are not late just yet and we are working hard to lead the market here."*

In Q2 '13, BOE Technology reported an 8.9 percent operating profit margin, while China Star Optoelectronics Technology (CSOT), a unit of TCL Corp, achieved a 9.6 percent margin. LG Display, the world's No.1 LCD maker, posted a 5.6 percent margin, while Samsung Display, a unit of Samsung Electronics, had a whopping margin of 13 percent. But take out the OLED business and Samsung's LCD margin drops to somewhere between 3 and 7 percent.

To show you just how severely the winds have changed against Japanese TV manufacturers, Sharp Corporation – the company that basically invented the LCD TV – reported a 0.5 percent profit margin for Q2 '13, after several quarters of red ink. Can the Chinese do to Korea what the Koreans did to the Japanese? It's entirely possible: During the same Q1 '13, global TV shipments grew by 4% Y-Y, according to NPD DisplaySearch. But all of that growth was in mainland China, where TV shipments ramped up an astonishing 28% Y-Y. Take out those numbers from the overall worldwide shipments total, and LCD TV shipments actually declined almost 4% Y-Y.

In recent weeks, we've seen a flurry of 4K and UHDTV announcements from Panasonic, Sony, and now Sharp. The latter, which unveiled a 70-inch 4K set (LC-70UD1U) at CE Week back in June, is now shipping it and the SRP (so far) is \$7,500. Keep in mind that Sony brought out its LGD-manufactured 84-inch 4K LCD TV for \$25K a year ago; LG dropped that price by \$5K not to long after, and JVC's 4K monitor version (also using the same LGD panel) is available for \$15K.

Samsung and Sony both have 4K LCD TVs in the 55" – 65" range that are retailing for about \$90 – \$100 per diagonal inch. That's quite a drop from the nearly \$300/diagonal inch that Sony started out with in 2012! There's no question that everyone is jumping the gun on pricing, and it's most likely due to worries about the new crop of



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# Display Industry Calendar of Events










Please notify [mark@veritasetvisus.com](mailto:mark@veritasetvisus.com) to have your future events included in the listing.

<i>October 2013</i>			
October 1	Quantum Dot Technology Seminar	Seoul, Korea	
October 1-2	3D Entertainment Summit	Hollywood, California	
October 1-5	CEATAC Japan 2013	Tokyo, Japan	
October 3-5	Viscom	Milan, Italy	
October 6-9	Interactive Tabletops & Surfaces	St. Andrews, Scotland	
October 6-10	Frontiers in Optics	Orlando, Florida	
October 7-10	Korea Electronics Show	Seoul, Korea	
October 8-10	Semicon Europa 2013	Dresden, Germany	
October 8-10	Plastic Electronics 2013	Dresden, Germany	
October 13-16	ElectronicAsia 2013	Hong Kong, China	
October 21-24	Solar Power International	Chicago, Illinois	
October 21-24	Showeast	Hollywood, Florida	
October 21-25	ACM Multimedia 2013	Barcelona, Spain	
October 22-23	Printed Electronics and Membrane Switch Symposium	Orlando, Florida	
October 22-24	SMPTE 2013	Hollywood, California	
October 22-25	Interactive Technology Summit	San Jose, California	
October 23-25	FPD International	Yokohama, Japan	
October 24-27	CeBIT Bilisim EurAsia	Istanbul, Turkey	
October 27-30	AIMCAL Fall Technical Conference	Charleston, South Carolina	
October 29	International Symposium on Emerging and Industrial DLP Applications	Frankfurt, Germany	
<i>November 2013</i>			
November 3-7	Solid State and Organic Lighting	Tucson, Arizona	

November 4-5	CEDIA China Expo	Shanghai, China	
November 4-8	Color Imaging Conference 2013	Albuquerque, New Mexico	
November 5-7	Viscom	Dusseldorf, Germany	
November 6-7	Createasphere/Entertainment Technology Exposition	Burbank, California	
November 12-13	UK Plastic Electronics Show	Birmingham, England	
November 15-16	Digital Hollywood Fall	New York, New York	
November 18	Silicon Chip Industry Training Seminar	London, England	
November 18-19	WCPC Annual Technical Conference	Cardiff, Wales	
November 19-21	SATIS 2013	Paris, France	
November 19-22	SIGGRAPH Asia	Hong Kong, China	
November 20-21	Printed Electronics US	Santa Clara, California	
November 25-27	China International Touch Screen Exhibition & Seminar	Shenzhen, China	
<i>December 2013</i>			
December 3-6	European 3D Stereo Summit	Liege, Belgium	
December 4-6	IDW/AD	Sapporo, Japan	
December 4-6	SEMICON Japan	Tokyo, Japan	
December 9-12	CineAsia	Hong Kong, China	
December 20	China Touch Conference	Shenzhen, China	
<i>January 2014</i>			
January 5-6	Storage Visions Conference	Las Vegas, Nevada	
January 6-8	Digital Hollywood CES	Las Vegas, Nevada	
January 7-10	2014 International CES	Las Vegas, Nevada	
January 12-14	International Conference on Imaging Theory and Applications	Phoenix, Arizona	
January 15-17	NEPCON World Japan	Tokyo, Japan	
January 15-17	Lighting Japan	Tokyo, Japan	
January 23-24	International Thin-Film Transistor Conference 2014	Delft, Netherlands	

January 28-29	DisplaySearch Japan Forum	Tokyo, Japan	
<i>February 2014</i>			
February 1-6	Photonics West 2014	San Francisco, California	
February 2-6	Electronic Imaging 2014	San Francisco, California	
February 2-6	Stereoscopic Displays and Applications	San Francisco, California	
February 3-6	Flexible Electronics and Displays Conference	Phoenix, Arizona	
February 4-6	Integrated Systems Europe	Amsterdam, Netherlands	
February 4-6	ICE Totally Gaming	London, England	
February 11-13	Digital Signage Expo	Las Vegas, Nevada	
February 12-14	Semicon Korea	Seoul, Korea	
February 13-15	Imagina	Monaco	
February 15-20	Medical Imaging	San Diego, California	
February 16-19	Tangible, Embedded, and embodied Interaction	Munich, Germany	
February 17-21	Hollywood Post Alliance 2014 Tech Retreat	Palm Springs, California	
February 21-23	Sound & Vision 2014	Bristol, England	
February 23-26	LED China 2014	Guangzhou, China	
February 23-26	Sign China 2011	Guangzhou, China	
February 23-26	Haptics Symposium	Houston, Texas	
February 24-27	Intelligent User Interfaces	Haifa, Israel	
February 25-27	Broadcast Video Expo	London, England	
February 26-27	Electronic Displays Conference 2014	Nuremberg, Germany	
February 26-28	PV Expo 2014	Tokyo, Japan	
<i>March 2014</i>			
March 3-4	US FPD Connected Devices	Santa Clara, California	
March 5-6	Createasphere/Digital Asset Management Conference	Los Angeles	
March 7-9	Augmented Human Conference	Kobe, Japan	
March 10-12	DVB World	Prague, Czech Republic	

March 10-14	CeBIT 2014	Hannover, Germany	
March 10-14	2014 Measurement Science Conference	Long Beach, California	
March 14-16	Symposium on Interactive 3D Graphics and Games	San Francisco, California	
March 17-21	Game Developers Conference	San Francisco, California	
March 18-20	Image Sensors Europe	London, England	
March 18-20	FPD China	Shanghai, China	
March 18-20	Laser World of Photonics China	Shanghai, China	
March 23-27	Advances in Computer-Human Interactions	Barcelona, Spain	
March 24-27	Cinemacon	Las Vegas, Nevada	
March 25-27	APEX Expo	Las Vegas, Nevada	
March 26	Quantum Dots Forum	San Diego, California	
March 26-28	Phosphor Global Summit	San Diego, California	
March 26-28	Eye Tracking Research and Applications	Safety Harbor, Florida	
March 27-29	MacWorld Expo	San Francisco, California	
March 29-30	Symposium on 3D User Interfaces	Minneapolis, Minnesota	
March 29 - April 2	Virtual Reality 2014	Minneapolis, Minnesota	
<i>April 2014</i>			
April 1-2	Printed Electronics and Photovoltaics Europe	Berlin, Germany	
April 2-4	Printed Electronics & Electronic Materials Show	Seoul, Korea	
April 5-10	NAB 2014	Las Vegas, Nevada	
April 7-10	MIPTV	Cannes, France	
April 7-11	Eurographics	Strasbourg, France	
April 9-13	LAVAL Virtual	Laval, France	
April 16-18	FineTech Japan & Display 2014	Tokyo, Japan	
April 16-18	Touch Panel Japan	Tokyo, Japan	
April 17-18	Taiwan FPD Conference	Taipei, Taiwan	
April 22-25	International Conference on Animation, Effects, Games, and Digital Media	Stuttgart, Germany	

April 23-26	International Sign Expo	Orlando, Florida	
April 26 - May 1	CHI 2014	Toronto, Ontario	
April 26- May 1	Sign UK/Digital Signage Showcase	Birmingham, England	
<i>May 2014</i>			
May 5-7	CeBIT Australia	Sydney, Australia	
May 5-9	SPIE Defense, Security, and Sensing	Baltimore, Maryland	
May 7-9	China International Touch Screen Exhibition & Seminar	Shanghai, China	
May 7-9	Graphics Interface 2014	Montreal, Quebec	
May 8-10	China International Touchscreen & Technology	Shenzhen, China	
May 14	Korea FPD Conference	Seoul, Korea	
May 15-17	SIIM 2014	Long Beach, California	
May 20-23	European Sign Expo	Munich, Germany	
May 21-22	Digital Signage Expo 2014	Berlin, Germany	
May 22-23	China Smart TV and Smart Display Conference	Shenzhen, China	
May 23-25	SEMICON Singapore	Singapore	
May 26-28	LOPE-C -- Large Area, Organic and Printed Electronics Convention	Munich, Germany	
<i>June 2014</i>			
June 1-6	SID International Symposium	San Diego, California	
June 2	SID Business Conference	San Diego, California	
June 3-7	Computex 2014	Taipei, Taiwan	
June 4	SID Touch Gesture Motion Conference	San Diego, California	
June 5	SID Flexible Displays Conference	San Diego, California	
June 5-6	International Symposium on Pervasive Displays	Copenhagen, Denmark	
July 8-14	National Stereoscopic Association Convention	Murfreesboro, Tennessee	
June 10-12	E3 Media and Business Summit	Los Angeles, California	
June 14-20	InfoComm '14	Las Vegas, Nevada	

June 15-19	Nanotech Conference & Expo	Washington, DC	
June 16-19	CineEurope	Barcelona, Spain	
June 17-19	Photonics Festival: OPTO Taiwan , SOLAR, LED Lighting, Optics	Taipei, Taiwan	
June 17-20	Interaction Design and Children	Aarhus, Denmark	
June 19-20	Laser Display Conference	Taipei, Taiwan	
June 22-27	HCI International	Heraklion, Greece	
June 23-27	3D Research 2014	Seoul, Korea	
June 24-27	OLED Expo 2014	Seoul, Korea	
June 24-27	LED Expo 2014	Seoul, Korea	
June 25-27	3D & Virtual Reality Expo	Tokyo, Japan	
June 29-30	3DV	Tokyo, Japan	

## 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>.

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

## Sustaining Members



16055 SW Walker Road, Suite #264, Beaverton, OR 97006 U.S.A. Phone +.215.206.6506 [membership@lcdtvassociation.org](mailto:membership@lcdtvassociation.org)  
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