Archives July '06-SID

At SID 2006

Patricia Kimball Photos by Patricia Kimball Sketches by **Norman Quebedeau**

Part Three

The '06 SID show was the celebration of the LCD, the heated competition long over:
"The long term trend is clear. " said Paul Semanza at iSupply's talk: "LCD is the only display technology that spans 100" in TVs...to the smallest screens on mobile phones." PDPs and OLEDs will increase, he acknowledged, but he suggested there would be no displacing the LCD, outstripping all others in sales, improving its weaknesses, threatening plasmas' size advantage.

Manufacturers are reluctant to turn LCD fabs to OLEDs; he said, pointing out that only Kodak's small molecule simple (PM) OLEDs were selling; with CDT's PLEDs hardly a whisper; and, when compared to LCDs', OLED prices were high.

And he advised OLED makers to become LCD suppliers, and turn to BLUs (back light units.)

Novaled - 'The Four Main Problems with OLED:

Novaled is expecting market consolidation says Gildas Sorin, CEO:

" It took 10-15 years for OLEDs to mature - for the product to reach the market. So, the first OLED products came about 3 years ago: first, a 1" product used as a subdisplay on clamshell phones, an mp3 player display - it starts with the small sizes. During the LCD's first years in the 1970's in Tokyo, the small LCD was on everything. The quality was not nice. Now, LCD is dominant: LG.Philips is showing one at a 100". It will be the same for OLED. Because OLED brings huge advantages: very good color and contrast, and viewing angle problems; with "the advantages of plasma—fast reaction—without the disadvantages of heavy power requirements. The OLED has very low power requirements, especially Novaled's."

"The OLED belongs to the LCD camp: when you look at the TV, what you see is a grid of 20 transistors. An LCD means each point must be addressed individually, either via TFT or Active Matrix. For the OLED, we need to re-use this Active Matrix—the main part of the investment. It costs more than $2 billion to make an LCD factory; the main part is this Active Matrix.
With the OLED, you can re-use many parts of this investment and eliminate many assembly parts by deposition of 200 nanometers of organic materia!l OLED is not fighting against LCD technology; it belongs to the natural evolution of the LCD."

“Now we see the first Active Matrix OLED display coming to the market next year in mobile devices (Samsung's). In 2008 expect the market to deliver a large screen OLED for TV."

OLED power efficiency, comparable to LCD, is not good enough. Novaled is coming out with an OLED structure increasing power efficiency by a factor of 2 to 3, enhancing lifetime.

- lifetime: any technology has a lifetime = 50% of the brightness. Currently OLED lifetime depends on the brightness, but you must always check that brightness levels are not set artificially low—or high—to skew lifetime measurements.

- blue: We get 100,000 hours for both red and green, but the lifetime of the display is defined by the blue's. Two years ago, lifetime was 5,000 hours; today, it’s 20,000,. good enough for mobile phones. Regarding the 40,000 hours requested by the TV market - we don’t see why we won’t reach 40,000 in the next few years.

- sensitivity to humidity: we have to find an engineering process with good encapsulation.

Novaled just set a new record (with Philips) for a white OLED with 30 lm/w, a 2000 hour lifetime at highest brightness - 1000 nits. And we have developed a fully transparent OLED, also with Philips: imagine a "day and night" window. During the days when you don’t activate your lighting, it will be transparent. In the evenings you switch on your window and it generates the light!"

“I believe that lighting will be as important as display for the OLED."

“We belong to the nano world but carbon is a different story. Nanocarbon could be used to replace metals. Carbon is ubiquitous and cheap; metals are not.”

***

eMagin

“We don’t use blue; we use a white OLED with a color filter array. Kodak has demonstrated that capability. It offers better lifetime, higher luminance, with substantially better power performance—that is, lower draw on battery and USB. Lifetime varies with brightness levels - the monochrome green-only OLED XL has an estimated lifetime of 40,000 hours.. We've improved the brightness by a factor of 10.

Joe Runde holds eMagin’s OLED XL™ Microdisplay, the next gen OLED with greatly

enhanced life. *(photo by pk)*

eMagin also makes wearable computers readable in bright environments, for example the LiteEye™ and displays for fire-fighters. Lifetime in color (using white) is 50,000-60,000 hours. Note that 15,000 hours = 6 years of use.

The EyeBud 800™ offers full SVGA resolution from a portable video device. An eyepiece on a headset with ear buds and mike create a portable computer that you can plug in. The 3D visor is now for sale in multiple colors with microphone, and possible full stereo in 3D or splendid 2D at amazon.com.

***

Kodak's exhibit was a far cry from last year's outfitted Audi, and so were its goals.

Terry O'Toole, Intellectual Property Manager, OLED System, spoke for Kodak: "Kodak is not making any OLED displays. We did have a Joint Venture with Sanyo and made some, but that JV dissolved. We're still pursuing it, investing millions of dollars a year in OLED. It requires complex electronics and Kodak doesn't make that. Meantime, we developed the OLED technology for either Kodak *or others* to use.

We hope that someone will pick up the technology and run with it. "

"We are in the LCD brightness enhancement film business but we're not working on LCD displays. Basically, we think OLED is much better."

"What we have are prototypes that will fulfill the requirements for the lifetime of a digital camera, including power, luminance, viewing angle, color gamut performance. To make them you need something that's going to emit in RGB, in formats blue and yellow: white. There's a synergy that's more stable in white."

The Kodak Prototype V550 with AM635LX OLED (AMOLED) display. (photo by pk)

Kodak did not disclose its electronics partner.

Applied Data

Applied Data Net demonstrates its ADS XScale Design on Kodak's OLED, above, and its P.O.E. (Power Over the Ethernet) 32-bit computer with inverter and sound system, left *(photo by pk)*, at SID 2006. Powered Over Ethernet (POE) - Fred B. Salloum, Director of Marketing.

***

Kopin:

John Fan, President & CEO
"Kopin has multiple businesses. One is display where our core product is the microdisplay providing hi-resolution images in a small, low-power package. The screen is less than ¼ VGA in 0.16 inches— comparable to a grain of rice— full color up to SXGA. Kopin has sold more than 20 million to the viewfinder and military markets, with its high performance requirements for rugged conditions). The technology is AMLCD, transmissive (vs reflective), and with a single-crystal silicon in the display circuit. “We believe that for the mobile video ‘revolution’, —iPods, cell phones—there’s no good way to view content in high quality video in a portable, low-power, attractive package. So what we’re showing here is a lot of activity in 'eyewear.' All these demos are products of Kopin customers. We sell the 'guts—the display, and sometimes a module incorporating it."

It's the 'Intel inside' concept:- "sell the ammo, not the guns."

Jim Johnston, Kopin, Westboro MA

***

Ignis Innovation:

White to Yellow - "the Color Shift Problem"

“We believe OLEDs are displacing LEDs (with) inherently lower cost and higher performance but they won’t displace the LCD. They can use amorphous silicon technology used in LCDs right now. With glass encapsulation, it’s not even an issue; it’s more of a problem with the flexible displays. The lifetime of blue is definitely still a problem: large TVs will require more than 30,000 hours.

As RG&B age differently you get a color-shift problem. If you use a white OLED with color filters, you avoid the color-shift problem but at a higher manufacturing cost. . RGB pixels all on simultaneously yields white. Then the color shifts to yellow.

“We’ve developed a way to make the next gen OLEDs more stable using existing LCD-manufacture technology.
- Stefan Alexander, Ignis Innovation, Ontario and Corbin Church, VP, Montreal, Canada

***

Fresnel Technologies, with a long and esteemed presence in the industry, showcases its gorgeous products like museum pieces. ZincSelenide lens for night vision.

Imagine Optix is a start-up debuting their core technology - LCOS projectors- for the first time at SID 2006.

“We’ve figured out a way to take polarizers out of the LCOS/LC projection micro displays. Typical polarization loses 50-60% of light, standard for liquid crystals. Imagine small, high efficiency, low cost, super bright, portable displays, at a major cost reduction—we could even do ‘One Laptop per Child’. In fact, we’re in discussions with Mary Lou Jepson of ‘One Laptop per Child’”.

(Mary Lou Jepson, CTO of One Laptop per Child non-profit Assn., delivered a luncheon-address entitled “The $100 Laptop, the $35 Display, and the other $4 Billion.” OLPC is dedicated to developing the $100 laptop—a technology that could revolutionize how we educate the world's children. From an idea launched at the MIT Media Lab. first announced by Nicholas Negroponte.)

“There are two technologies for projection display: (1) DLP by Texas Instruments based on switchable mirrors, and (2) LCOS—which also needs polarized light. DLP gives the best performance, but is the most expensive. LCOS is lower in cost but less bright. What we’re doing is based on the low-cost of LCOS but with the brightness of DLP. For the portable projectors market—a mouse-sized projector or ‘video flashlight’ that plugs into cell phones and iPods and projects onto the wall.

- Michael Escuti, Assistant Professor, at North Carolina State U, Raleigh, NC, and partner with Imagine Optics.

***

CARBON NANOTUBES (aka FED or NED)

"CRT was ideal for TV except for its thickness, weight, and power consumption. The carbon nanotube—that is, *field-emission displays* or *nano-emissive displays* [FED or NED]—focuses at very small ranges and uses less power… The problem is having to build a factory! An LCD factory is figured at (around) $2 billion; but an OLED factory could be $100 million or less.

“Samsung has been talking about it for two years [and is not yet producing them yet.] Nanoproprietary is developing FEDs, so are a few other companies...Motorola had one at its hotel room at SID 2005.”

- Lawrence Gasman, Principal Analyst with Nanomarkets, LC, Charlottesville VA

***

Mitsubishi Chemical demo's its O-TFT-driven OLED prototype, hosted by Akira Ohno, Sr. Research Scientist: *(photo by pk)*

Mitsubishi sells the O-TFT materials for flexible displays:- high mobility equal to amorphous silicon. There is wet-coating process , with hi-resolution laser patterning, durable and stable.

“We’re in negotiations with some flexible display manufacturers. There’s no size limit but the target is 2” to 10” in the future.” - Akira Ohno, Sr. Research Associate, Mitsubishi Chemical.

***

"Plastic Logic makes flexible e-paper. Our core competency is this flexible display rather than the electronics; we make the backplane on a flexible O-TFT substrate, working with E-Ink to make these displays. The transistors are underneath the' paper' (plastic). The transistors are made on a plastic rather than silicon; electronic media (e-paper) on top of the backplane. The bottom is made up of transistors in an Active Matrix.- Anusha Nirmalananthan, Marketing, Plastic Logic, Cambridge UK

Plastic Logic’s e-Book 'page' refreshing (photo by pk)

According to discussions on the floor, the e-Book outranks the book for use on the beach: the e-Book gives better glare protection than the Gutenberg - derived product.

***

What’s happening at **Nemoptic?** The BiNem® e-Book. With high resolution and high contrast, and a fast refresh rate, quite comfortable to read. More economical than TFT, the e-Book exists now in 2.8” - 5”; soon up to 14”. It can do 32 levels of grey and is bi-stable. (Last image stays on.)

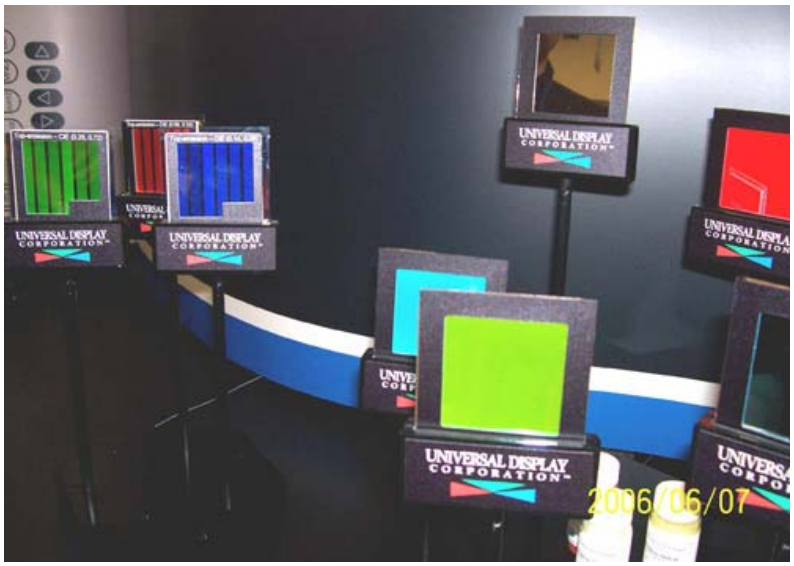
“Nobody else knows how to do this now, and, as you can see, there’s no battery. We’re delivering prototypes to customers right now.” - Jacques Noels, Chairman and CEO, Nemoptic.

***

Universal Display Corporation:

"If you put a current to thin film, it emits light. Universal Display developed some structures and saw that if you emit light from the top of an OLED instead of from the bottom, the color saturation of the emission is enhanced."

Universal Display contrasts the red, green, and blue saturation achieved via top-emission (clustered at left) and bottom-emission (clustered at right). It’s the same material or dopant in these OLEDs. *(photo by pk)*



"The first full-color Active Matrix OLED main display in a telephone, with gorgeous color and a 180-degree viewing angle, is being sold in Asia now—soon in Europe. World Cup sponsor BenQ acquired the Siemens cell phone business. AUO makes the displays using Universal Display technology." - Sid Rosenblatt, “Serial Entrepreneur” and Exec. VP & CFO, Universal Display, Ewing NJ

***

Horizon’s 40” SAW Touch Monitor—go ahead and finger paint! *(photo by pk)*

***

White Electronic Designs (Portland OR) originally specialized in avionics , creating reliability solutions to withstand shock and vibration. They took their Max-Vu™ Technology from avionics into commercial applications, for example, PC tablets, displays readable in full sunlight. – Amer Malik, White Electronic Designs, Portland OR.

***

Flexible Display Center showing its process. *(photo by pk)*

Arizona State Flexible Display Center at Tempe is two years old and things are rolling along with OLEDs and two reflective technologies—electro-phoretic ink (with e-Ink) and with Cholesteric Liquid Crystals (Kent Displays.)

“We’re a University-led partnership, not a manufacturer, to develop and integrate technology showing flexible displays are viable. We want to show not only that the technology works, but that we can develop manufacturing processes and tool sets in parallel.” – Greg

Raupp, Div FDC, Tempe, AZ

***

At the ever-hospitable smoking section outside the Convention Center, a German gentleman from MBraun (gases) told the writer that he loves Phoenix and Malaysia best; Munich is the best place in Germany. What about Berlin? “Too many Russians!” He was heading for Bryce Canyon after the show.

***

Nice to unwind, after a hard day of tromping through exhibits, at the **iFire** reception at the Marriott.

A multinational crowd—from Hong Kong to Minnesota—filled the room, drinking wine in long-stemmed martini glasses lit from below with a blue light and the iFire logo.

A J&B in one hand and a pen in the other, the writer approached John Moore of iFire.

“What’s the problem with OLEDs? They’re small, emit light, and they don’t last. Electrons and holes combine and excite the organic light-emitting molecule to emit a photon in the form of heat, light, or a chemical reaction. It breaks the chemical bonds. The little molecule is fragile!

“We are quite similar to OLEDs but we light up an inorganic crystal. We call it our ‘blue phosphor.' It’s electroluminescent. We put it in an electronic field and it glows. The breakthrough five years ago was finding the right inorganic blue light source. Everything else is similar to OLED. It’s vapor-deposited but everything else is done like an ink:: screen printed and low cost. Of course, inorganic will not be flexible. Our one product is domestic TV—mid 30-to-40-inch, very thin and very light—solid state thin films with electronics. It’s like a big 34-inch chip. The color is beautiful.”

– John Moore, iFire, Toronto, Ontario, Canada

***

One of the few women at SID, the woman with Mitsubishi Chemical, was standing by the trunk of a car getting ready to go back to Goleta CA. “I’m a physicist, so I’m used to so many men—but not all in black suits!”

***

FED and NED:

Dr. Kenneth Dean, NED Project Team leader, Motorola Labs, Tempe, AZ spoke regarding carbon nanotubes.

CNT's got brightness and video speed, and it’s inexpensive. If you’re going to make modules, it’s less expensive than plasma, LCD. Our cost module is the actual set-top box. We can do it technically. Currently we have demo units."

“In the US there are no large manufacturers of big displays. We need a partner in Asia to fabricate them and Motorola is actively seeking partners. The actual equipment is similar to existing PDP and LCD fabrication lines. There are lines used to make big displays sitting unused. We’re looking at all sorts of business structures.

“The 8th generation substrates approximate 2 meters square, with six 52-inch displays cut out of them. They’re too big to fit through tunnels; even the tool to make them doesn’t fit on a train.

“Displays less than 1 cm thick, plus braces, plus structural support glass, plus CNT together are about 5 mm—plus the circuit boards. They use the same phosphors as the CRT, yielding the same color rendition. We’re targeting the 40-to-50-inch flat display market.”

FED and NED:

Later Ken Dean spoke to the listening audience:

“We had a major consulting firm do some cost model analysis and our NED panel cost projections come in lower than the LCD or PDP large area flat screen.
We grow nanotubes on glass substrates. We never subject them to further treatment and yet achieve a low cost, high quality display. We put down catalyst with any technique you want. You don’t need to activate it; it works right away. Our platform is a 6” display with TFT or whatever you want.

We can make nice high-density packets of nanotubes, but we find that a low-density packet looks better. Obtaining high brightness is conceptually easy. Just turn up the anode voltage, ... which is what we do. We are capable of getting brightness of 700 candelas per meter square."

Dr. Dean showed a slide of Nemo the smiling red fish, comparing the image on a plasma display to the pristine source image and both to an image from Motorola's NED. Dr. Dean circled a blurred area and an artifact on the plasma—blemishes that did not appear on his NED. And the signal stripes which are washed out on the plasma, come through on Motorola's NED.

"We'd like to use anode voltages greater than 10V. We use a metal grid and a hot filament electron gun… and invisible spacers. We've demonstrated brightness above 700 cd/m^2 and spacing to 1.7mm keeps the applied field under 4V. They've got good quality spacers and cheap."
Dean spoke quickly and clearly. There were no questions.

Samsung's: Dr. Chang introduced the session, with Chris Curtin from Electronics Display co-chairing. The first paper was "Recent improvements in brightness and color gamut of Carbon Nanobute Field Emission Display", by E.J. Chi, Samsung SDI and others. "This work has been done by me and many of my colleagues," says Dr. Chi. "The company is improving the quality of the prototype, especially for blackness and color gamut, also uniformity will be discussed." A new green phosphor was introduced.

"The backplate structure is well known. We can easily attain a 3μA/cm^2 emission current. We've changed from the convention green phosphor, with 94% NTSC color gamut, screen efficiency of 7.7 lumens per watt at 7K voltage."

"Key performers affecting consumers are (1) uniformity, (2) Brightness, (3) color gamut. How to improve uniformity? By panel and/or by electronics—***the most difficult to solve***. Brightness and color? Modification of the phosphor screen.

"One of the ways we can improve uniformity is to improve the resistive layer, for example, pixel-to-pixel uniformity but results in increase of driving voltage. Increasing the number of emitters by creating more emitter holes or to minimize the size of gate holes in same size area. Also can optimize number of emitters through calculations. Increase in number of emitters yields uniformity improvement and decrease in driving voltage. Uniformity increases proportionally to the increase of driving voltage (26 ea yields 52 each). Increase in emitter holes reduces driving voltage and improves uniformity. We don't want more than 90V scanning voltage."

"Review of Green Phosphors: For wider gamut and higher efficiency, we chose CrGa2S4EU – a better candidate. SGS green tests higher efficiency than CRT green—sharper and higher relative intensity than ZnSCU, Al, and 10% higher efficiency at acceleration voltage of 4kV."

"Greater brightness and color gamut: Brightness and color gamut are sufficient for FED commercialization."

Dr. Chi disclosed approaches to uniformity, introduced the new green phosphor, and showed attendees moving pictures of a Las Vegas Casino—full of bright colors—from the 15" CNT-FED prototype for 40" HD-TV. "You can see some defect lines and not great color balance but you've probably never seen such good color on CRT."

A member of the audience asked how the new green phosphor behaves over its lifetime?

"We're examining the lifetime but the image is the problem, not the phosphor. I don't think the phosphor can cause the problem of lifetime to our device."

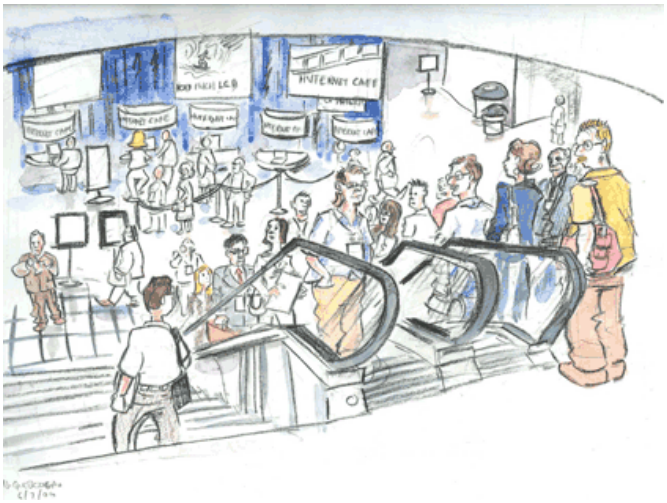
***

"SID is different this year. Last year, there were a lot of academic sessions; this year, a lot of applications sessions."

Packing up to go. *(photo by pk)*

At SID 2006

Part One (June 25, 2006)



Welcome to SID

At the Exhibit Hall entrance and above ten internet Café stations provided by LG Philips LCD, a huge poster shows a Hawaii-style wave crashing out of a 100” LCD: “What we have dreamed of” by LG Philips LCD.

The first morning of the SID show, Samsung SDI Company’s Dr. Min-Suk Lee, CTO Electronic Material Development team was drinking coffee and munching a ham & egg sandwich at Starbucks near San Francisco’s Moscone Center. Dr. Lee studied near Frankfurt, his 2nd home; his wife is an opera singer in Dresden.

Samsung’s Kanjon City, he said, is a Gen 7 fab close to the desert. LG.Philips also has a factory town in Paju, near Seoul. “LG.Philips is a big competitor for us in electronics—LCD and plasma,” said Dr. Lee. “Matsushita is showing a 103” plasma. We’re showing our 102”—the largest at Samsung—just for example.” Lee went on to say," plasma price is coming down.“ “Mass production is very difficult and expensive.”

“In the past, TV was just TV; today—with the Internet—it’s two-way communication. In the cities, there’s danger outside; people like to stay home. TV is a window to communicate."I don’t watch TV,” he adds, “I just produce it...(but) I would choose plasma because the light is warm.” ***

SID Keynotes were packed, with standing room only and clusters of people sitting in the doorways.

Bok Kwan, VP of LG Philips LCD: opened with a quote from Darwin:

“It’s not the strongest but the most adaptable to change that survives. This evolutionary theory also applies to industry; those that fail to adapt fail to survive.”

He spoke for LCDs; later Panasonic's Takeshi Uenoyama spoke for PDPs, Qualcomm's Paul Jacobs Jr. for his cellphones..
The speakers made few bones about extolling their company products and promises.

LCDs came first, as they would throughout the show, acknowledged this year as the overwhelmingly unstoppable first choice, edging out plasmas, possibly setting back OLED manufacturing timelines.

(Wildcards include Samsung's start of mass production later this year, with another OLED surprise coming from Dupont.)

Kwan showed a short film with the little Darwinian ichthys-with-legs logo throughout, depicting the progress of technology from the Victrola to the cell phone.

”In the long history of humankind (and animal kind, too), those who have learned to *collaborate* and *improvise* most effectively have prevailed. –and that’s true of the LCD industry... In 1897, the Braun tube was invented; in 1936 electric TV and broadcast started. Today LG Philips LCD TFT-LCD makes history with several firsts-to-market:.....LCD is now almost 50% larger than in 2000. The 2000-2010 forecast is that it will increase 178%. TFT-LCD shipments show strong growth, mainly led by TV. ...(We have) TVs of 1950x2200 mm—“the size of a king-size bed!”

"Among many LCD Market Drivers is the narrowing price gap (compared to CRT and PDP.) LCDs were 7x more expensive; (today) they are 3x higher (than CRTs.) The LG Philips 100” TFT-LCD is the world’s largest full HD-TV, with copper bus-line technology ... 1.07 billion colors yield high color depth and a gamut of 92%.”

"The next-gen LCD technologies will see copier technology, LED backlight, color filter lens. OLED and LTPS are still in their infancy. OLED: is extra bright, fast response time, great for viewing image. But there are hurdles: reliability, cost, lifetime.
He looked kindly at Flexible Displays: ' - no limit on substrate size, with new applications including credit card, e-book, PDA, e-news; wearable displays."

Concluding with “Survival of the fittest,” he said LCD will remain a leading display technology for years to come, while " other next-generation technologies will be part of the future."

Panasonic's Dr. Takeshi Uenoyama —the largest maker of plasma TVs, discussed technology and business strategy:
Slim with longish, salt & pepper hair, Dr Uenoyama is from the Advanced Technology Research Lab and Image Devices Development Center, Matsushita Electric Industrial Co., Ltd.

He believes all FPDs will exceed 50% of the total market by 2010, while PDP & LCD together in 2010 will share >70% of total revenue. He pointed to large-sized TVs as the main market trend (>30”, with 26-29” following). PDP power consumption, he said, is almost the same as LCDs'.

Panasonic showed the World’s Largest 1080p HD Plasma: 103” at CES in Las Vegas.

Improved productivity at the P3 factory (in Amagasaki, Japan) can supply global demand for 2006: 5.04 million per year (for 2006), giving almost a prediction for prices coming down.

Soon flexible, large, light displays are coming, he said (film LCD or OLED.) Plasma tube array, and further high definition. Plasma Tube Array :includes two new technologies in R&D for future PDP::first: a.new discharge P+D by APDC showing higher efficiency panel (5.7 lm/w in an 11-inch panel), and second: New protective layer R&D by NHK\ is improving efficiency in the panel with “SrCaO.”

Phones:
Qualcomm's Dr. Paul Jacobs, asked “How many of you thought you brought your cell phone to make phone calls? More and more it matters what you can *see* on your phone."

“People go back home for their wallet—and then for their phone...The main challenge for adopting multimedia applications is more display usage:
Current displays are largest drains on mobile phone battery energy and, at the end of the day, you still want to be able to make a phone call...

Most of the energy in the phone is used by light, (while today's) displays have limited viewability in various lighting conditions and operate in limited temperature ranges."

Qualcomm's Iridium features. iMod display advantages: "you can leave it on but it doesn’t use power if you’re not using it, and it’s reflective, so it scales with ambient light."

***

Overheard in the Press Room:

“Nano-based field-emissive display technology is an old technology but it was so expensive to manufacture. But now, with the carbon nanotube, they can do it.”

“No one has had the guts to show one [a nano-based field-emissive display] on the floor.”

“I want a mature or semi-mature flat-screen, carbon nanotube screen on the floor.”

“Everyone’s going HD-TV in Europe but the conversion is not complete. There are only 3 HD-TV content providers (stations) and one is pay TV… People go to the store and it looks great but when they come home, it looks terrible: all their content is PAL standard. But they just spent 1500 Euros so they have to tell themselves that it looks great.”

"The CIBA show in Germany is the biggest madhouse of them all—worse than NAB."

***

Samsung: Expansion of the LCD Market:

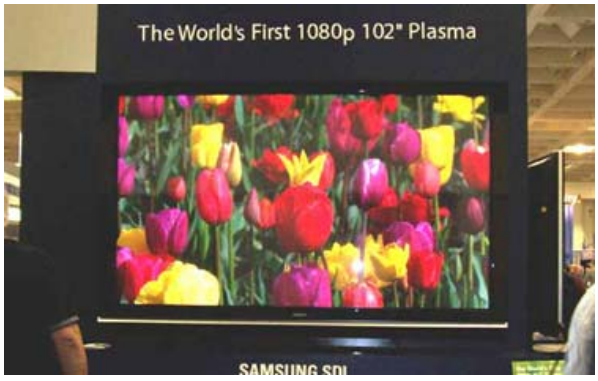
“LCD continues to challenge PDP in large-size TV market”
Continuing the salvo of what would be echoed through the week, Bruce Berkeley, Samsung VP of LCD Business, said the contest between LCD and PDP was really over: the choice has taken place."

"Prices for LCDs fell faster than for PDP & RPTVs with almost a 6% price decline for May over April.('06.) PDP price is shrinking too but not as quickly. The LCD/PDP price gap is narrowing (at the same time) the LCD viewing experience has improved. LCD is improving clarity, viewing angle, color, motion picture; 92% of NTSC .while legacy issues such as low contrast, color accuracy, power consumption, viewing angle, motion blur—all these are in the past.”

“PDP has legacy issues, too: high power consumption, image retention/image burn-in. But only the LCD can really prove that its legacy issues are (over..”)

At a mall “you see lots of lights: LCD performance is better [than plasma] in a high-light ambient illumination environment. Sony, who brought you the Trinitron, stopped development of plasma. They felt they were better off investing in LCD—and Sony is the Gold Standard.”

Samsung Gen-8 is under construction, with “massive investments in LCD capacity.” Before-and-after photos showed the Samsung fab transforming a skeleton of a city to a dense metropolis.



"35-39” LCD’s will own 78% (3/4) of the market. Samsung skipped this Gen 6 size and went straight to Gen 7 at 40-49”.

"We’re going after the 50” TV market share: This is a great time to be in the industry. Things are changing."

Q&A: Early adopters want to buy FPs.. Do you need a 1080p display to see TV in your living room? "I don’t think it’s necessary because you’re not even going to see the pixels. But LCD has 1080p so we have to have it with plasma. But I don’t think customers can tell the difference."

Samsung SDI’s 102” plasma is 90.94x52.17, with 68.7 billion colors.

Samsung SDI:

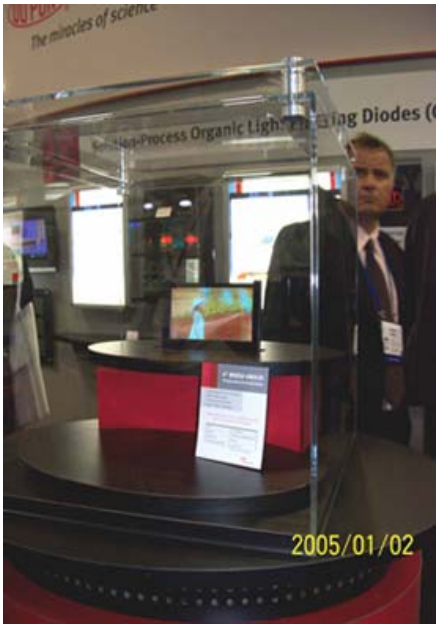
AMOLED *vs* TFT-LCD: “Our plan is to begin production as of 1/2007 in mobile applications at the 2-inch level and, in 2008, begin 4.3-inch WQVGA AMOLED.”

SamsungSDI 2"AMOLED compared with LCD


Samsung SDI 17" OLED (UXGA/RGB)

"OLED compares favorably with LCD; viewing angle is almost perfect and color is high in purity." – Hye Dong Kim, Samsung SDI
"The 4.3" AMOLED display uses super-grain silicon (SGS) technology. SDI's PMOS circuit diagramming and processing technology is used, promising lower number of masks and production cost. It has reduced investment and maintenance cost (about 70% and 90%, respectively) compared to laser annealing silicon technology. High quality display by 8-bit datacoding is realized. And a new concept—multifunction polarizer film—improves the contrast ratio.

DuPont:



We are working with Samsung. Last year's display was on a Samsung backplane; this year's isn't. There's an array of thin-film transistors to turn each pixel on and off. Our development is focused on starting from the backplane building up the OLED device. We still work with Samsung and other companies because there is still development work to be done on the backplane.

OLED: "In general, the technology puts down layers of highly engineered organic materials (either polymers or complex non-polymeric molecules). We want to develop the process so we can first print displays out of a liquid solution versus laying down a vapor as is shown at the SDI booth—that is, OLEDs are usually made by vapor-deposition. Active Matrix (AM OLED) uses a thin-film transistor backplane."

"DuPont makes materials for printing and publishing." [the writer can't help but notice that printing and publishing industries view the problem of how to lay down light-emitting material as though it were ink]. "In the Passive Matrix (PM OLED) model, cathode lines go this way and anode lines that way (criss-crossing). This technique works fine for little displays such as in cell phones.

"With OLEDs, if we turn the pixels off, there's no light coming from anywhere, versus LCDs that have a constant backlight."

"We can cut 30-50% out of the cost of making a flat panel display but we're a few years away from making a large TV. But we can end up making a better display due to inherent superior contrast ratio, color gamut, on-par resolution, better response time with no smearing of images from on to off (<1/10 of a millisecond, that is 1000 times faster than LCD). So, moving images and video look better on an OLED.
Ultimately, because there's less energy consumption and it's organic, people are thinking futuristically about roll-up. The Government sponsors a lot of work on flexible displays [much of it for military applications]."

"About half a billion dollars worth of OLED displays have been sold/projected to sell for 2006. $400m worth sold in 2005 in the whole OLED industry, so it's not commercial now, but we expect to see it used in automotive, cell, and mp3 applications."

If you look at where LCDs were in the 70's, they were mostly in watches. LCDs took almost 30 years to mature" [at least 3 people defended emerging technologies at this show to me by quoting this 30-year development phase required for LCD technology.]

Last year they made a great breakthrough in SMOLED (small molecule OLED) and PLED (polymer LED) SMOLEDs were invented first and are farther along in development. You can get small molecule materials with very long lifetimes. But until this year, the only way to put them down was by evaporating them [the “vapor” technique]. So we’ve announced this year a way to build upon OLED using those materials by printing them. We’re showing them—“solution-processed small molecules. AMOLED has to do with the construction of the display but is using SMOLED materials."

The 6” WQVGA AMOLED is the world’s first printed, full-color AMOLED display with small molecule OLED material, with 80ppi resolution, full white brightness 300 cd/m^2.—made in Santa Barbara
David Flattery, DuPont, Santa Barbara CA.

***

Clarex (films and filters) exhibited its Blue Ocean® Screen. A Panasonic TH-LC50J Projector projects a moving image up from the floor into a pedestal-mounted prism in which the image (underwater life) is reflected.

At SID 2006

Part Two

The ColorLink 3D Theater offered a place to sit in front of a cartoon—and 3D glasses that make the monsters jump right out of the TV. Bystanders chatted about the stereoscopic viewers we had as kids; some went to drive the simulated car in a 3D virtual city. This demo of ColorSelect® and PolarCorrect® used two LCOS projectors showing a 70” diagonal video game/street car-racing simulator .LCOS

gaining a surer foothold with Sony's SXRD, and JVC's long maturing DILA.

ColorLink's C.Y. Michael Cheng, Applications Engineer, works with Arisawa in Japan for the film. ColorLink makes the glasses. [NHK content
is rendered for use on a Sony Bravia.]

"For this system we're using two JVC projectors that have been modified for 3D. We put circular polarizers in them for Right and Left.We have been producing LCOS with JVC for a long time. We make the engine—the color quad [polarization optics] are Color Link's."

***

Sharp shows its 26" two-way viewing angle LCD, SID Display of the year 2006 winner. Like an Agam painting, the viewer sees one picture from one angle and a second from another.

"Sharp used to buy picture tubes. Now we make our own LCDs. Flat TVs will be our future and we think LCD is the technology that will win. The LCD market is just so competitive and you have to constantly improve your plants—prices and yields."

"Our SID efforts are focused on industrial displays—small (handheld and/or portable) test equipment, patient monitors, GPS systems, and Strong2 technology . Sharp has met and exceeded all standards." Todd Stonewall, Sales and Marketing, Sharp, Camas WA

We later heard that off the floor, in a hotel room, Sharp was showing an OLED: a 3'6" PLED.

* * *

Cambridge Display Technology featured a mural depicting indoor and outdoor scenes on Main St,. embedded throughout with (PLED) screens of various sizes and functions, from the bus terminal, the bank, and the outdoor display to kitchen and car, computer to cell phone.

"(For samples of PLEDs) "See the Osram and Delta displays—we're R&D, so it's up to the manufacturers to produce them. Everything on the panel is OLED—and you can buy them." - James Wiltshire, CDT "The sign board and the big-text displays are older technology—spin-coated (centrifugal) vs. inkjet print. "It's the next big thing."

(photo by pk)

"There's definitely hope. We printed a 14" display. Seiko Epson has shown a 40", potentially very cheap. Sumation (joint venture of CDT and Sumitomo) is working on all three colors :RGB. "

"In older displays, the whites have a yellow tint, whereas in the new displays, white is whiter." (this writer thought blue looked a little greenish).

Two side-by-side, 5x5 diagonal (postcard size) PLEDs showed old vs. newer blue. "We use fluorescent polymers. Fluorescent material had been used, but now phosphorescent materials (dendrimer) can be used. Kodak and UDC are also using phosphorescent materials but with the vapor-depositing process.

"We've established that we can mix the materials in the same displays."

"A fluorescent blue (lasts) = 12,500 hours at 400 cd/m^2 9 cd/A efficiency vs. 50,000 hrs at the same for green and red.."

***

(photo by pk)

Solomon Systech shows its OLED-driver controller for mobile displays

***

Mum's' the word regarding the Canon-Toshiba SED. The Toshiba booth emphasized industrial displays ; Canon did not exhibit. "They're not doing any shows; SED is just too far off." – comment overheard. At the Wednesday's Corning Breakfast, a journalist from Taiwan quoted Toshiba-Canon's CEO as saying that they will not give up on the SED.

Fraunhofer exhibits its rotating transparent 128x64 OLED display. It's see-through for laying information over a background that you see from the rear. A possible application is in a car while driving.

"Fraunhofer is strictly R&D; someone else can do the applications."
Fraunhofer exhibited highly efficient RGB OLEDs from an in-line production system, including a striped RGB OLED panel with touch buttons to change color (red, blue, green, white, black). The PIN-OLED is on ZAO (Zinc Oxide) instead of ITO (Indium Tin Oxide) to achieve a high efficiency. (Anode material: aluminum doped zinc oxide.)

Also shown was: a demo of image projection using the MEMS microscanning mirror. MEMS systems can make full-color projection which can be integrated into the size of a sugar cube. Laser sources at this size are currently not available.***

***

Osram's Pictiva OLED display showing applications in industry, consumer, automotive, and 'white goods'.

Siemens is the granddad of Osram, now 100 years old.: Osram-Sylvania and Osram Opto Semiconductors The company has evolved from light bulbs ["lamps"] to hi-tech lighting for electronic applications.

Osram showed its light sheets—a luminescent, translucent sheet instead of a light box. You can put graphics on them and/or use special films—for example, textured. And you can use these thin sheets of light for entire walls, ceilings and floors, as well as signage."

"I'm looking at LEDs' uses in three years, PDA and mobile phones are 100% LED applications todat, we're using backlighting in small displays, medical applications ; the next step for Osram and the ED market is post-card-size navigation systems for car GPS. Our real target is LCD TV. Osram makes LEDs for LCD TV. "- Winfred Schwedler, Osram Opto Semiconductors, San Jose

Osram Sylvania

"In 5 years' time, LEDs will be 5-10% of ambient lighting. Instead of a light bulb, you'll put up a ceiling tile and program its sensors to change lighting conditions according to nature's biorhythms." – Hilary Chalmers, Osram Sylvania Account Supervisor/Greystone Ptnrs.

Hilary demonstrates her radial LED knitting needles at the OSRAM booth. The LED knitting needles are powered by hearing-aid batteries.


(photo by pk)

“The big news about OLEDs is not only that they will go into GPS in cars, but that they will replace some fluorescent ambient lighting.. We’ve expanded the size offering from last year's 1.6” diagonal to 3.3” this year. It enables us to support broader markets, especially audio and entertainment .”
- John Cramer, Osram Sylvania

***

At **Corning's** Breakfast:: growing generation sizes, green regulations, and continued consumer confusion:

LCD glass has more in common with moondust (magnesium aluminum silicate) than with window glass."

Peter Bocko, VP promised : “This presentation is not a promotion of Corning but about glass."

"We hear a lot about glass in an LCD; in PDP we hear very little. SID President Larry Weber was one of the inventors of the plasma platform. He bought window glass. In plasma, glass is along for the ride; in LCD, it’s fundamental. The LCD came, creating low voltage, low power devices > Notebook in the 90’s > development of desktop monitor in LCD. The LCD platform is very versatile across a broad size-range. There are indications that LCD will progress in the TV industry—even more than we had anticipated...We see what our customers need and back-engineer to provide that.”

“It took from 1990-2000 to go from a square foot of glass to Gen 4—a bit less than 1 meter square. With Gen 5 you could do twelve 17” monitors at once. In 2003, Gen 6 was the first platform really designed for TV. If you knew what size someone ordered, you knew his market strategy. Sharp was the first customer to adopt Gen 6. The 32” is a good size for many applications. You can pick it up in the box and put it in your car. Gen 8’s 46” TV provide very good utilization (8 panels per sheet).(It) is really about going head to head with Plasma TVs.”

"Corning TFT-LCD manufacturing processes are as stringent as those in the semiconductor industry -superior in dimensional stability, surface quality, and flatness. The flatness has had the greatest impact on glass manufacture. You need a flatness of 10-20 nanometers over a millimeter (one millionth of the depth of a few business cards). .. equivalent to 4” wave of glass over the entire Pacific Ocean!"

“All hi-tech glass, not just LCD glass, bubbles up with heavy metals. In one Japanese prefect, city fathers told Corning that the purity of their river is our responsibility as well as theirs, so we eliminated arsenic and then other environmentally unfriendly gasses. LCD has the lowest environmental impact of all the displays… it is a substantial improvement over the CRT…Even though we are not being required to make an environmentally friendly or “green” product, we are doing it, rather than waiting for regulation.”

"The problem with OLEDs is they’re extraordinarily sensitive to moisture. You’d get black spots between the two sheets of glass immediately. OLED current-driven vs. LCD voltage-driven devices also require more stringent glass and sealing. We manufacture in Japan and Korea (our JV with Samsung).

"Gen 8 at Sharp and Samsung sizes are now breaking the 3-meter barrier. Gen 8 cannot be shipped in an ocean container.. Because of tunnels and bridges, you cannot really ship more than 3 meters [you can’t get it out of the factory and to the next step.] I think Gen 10 is a practical limit. Right now, shipping in containers is a significant part of the cost. I’ve seen 60” but how big does your LCD panel have to be?—and I’m an LCD fanatic!”

“In the spring, Corning will build a plant in China located in-country with the customers. This is a consumer electronic application so we’re always getting pressure to lower our price."

Q&A:
"You expect Gen 9 is a go and Gen 11 isn’t, right?
"I saw a slide yesterday of a Gen 10 and that’s as close to an announcement as I’ve seen. There are some tunnels in Taiwan that limit you to 3.2 meters."

"Is there any possibility that a plastic or some organic product or nanoparticles of an inorganic substance will replace glass?
"If so, that’s more than 10 years out, and the primary pull is the desire for flexibility. But Corning also sells plastic products…