

OLED Leader PANL Will See More Patent Challenges As Market Scales Up

Companies: AAPL, AMS:PHIA/PHG, AMZN, ETR:BAS, FRA:MRK, FRA:SIE/SI, KRX:005930, PANL, TYO:4901, TYO:6701, TYO:6752, TYO:6753, TYO:6758/SNE

September 12, 2012

Research Question:

Is Universal Display Corp.'s current OLED patent strategy defensible, and is the company positioned to grow for the remainder of 2012?

Summary of Findings

- [Universal Display Corp.](#) (PANL), also known as UDC, is viewed as the [organic light emitting diode](#) (OLED) industry leader. The OLED industry is a niche yet emerging market in both displays and lighting. Sources are optimistic that demand for OLED devices will scale up and that pricing will decline as a result.
- Nine of 13 sources who commented think UDC's challenges in defending its OLED technology patents and intellectual property will only intensify as the industry grows.
- UDC faces judicial and public sentiment against litigation, competitors skirting its patents by offering slightly different OLED technologies, and threats from companies with the resources to challenge UDC's patents if OLED displays become widely adopted and begin to generate significant revenue.
- Thirteen of our 16 total sources expect OLED display and lighting technology to experience greater demand. However, the rate of growth may be dimmed by the high cost and challenges associated with OLED display production, the anticipated retail pricing for OLED TVs (\$10,000 for a 55-inch set), questions regarding OLED's life span, and delays in the launch of large-screen OLED TVs.
- [Apple Inc.](#) (APPL) is not expected to use OLED display technology anytime soon and likely will to continue to use its own [Retina Display](#) technology.
- [Samsung Electronics Co. Ltd.](#) (KRX:005930) is UDC's largest customer for OLED licensing and materials, but Apple's recent patent [victory](#) over Samsung is expected to have limited or no effect on UDC.

Silo Summaries

1) DISPLAY LIGHTING & SCREEN DESIGN ENGINEERS

Three of four engineers working in the OLED field believe the challenges facing UDC's intellectual property protection will only intensify because new OLED technologies are emerging that are not subject to UDC patents or licensing. Also, UDC has alienated some manufacturers and is experiencing demand mostly from Samsung. Still, sources expect OLED demand to continue to grow and UDC to benefit as a result. Apple is not likely to abandon its own Retina Display technology for OLED technology anytime soon.

2) PATENT/LICENSING SPECIALISTS

All three sources think UDC will continue to grow in line with burgeoning demand for OLED displays. Two sources expect UDC to have difficulty in protecting its intellectual property because of the recent glut of infringement cases and negative public opinion against litigation. One coined the recent UDC patent cases as minor and yet requiring substantial effort to rectify. If OLED becomes a large revenue driver, companies with vast resources like Merck, BASF and Philips will be willing to team up to challenge UDC's patents. The dissenting source thinks the patents and licensing, if not too restrictive, could be a growth driver. He said cross-licensing is a better alternative than litigation. Apple's patent victory over Samsung is not expected to affect UDC sales.

3) CUSTOMERS, PARTNERS, SUPPLIERS

Three of four sources view Universal Displays patents as defensible based on recent litigation in UDC's favor. The outlying source expects an increase in the LED market as well as in the willingness to pursue litigation by companies like Merck and BASF. All four sources expect growing demand for OLED devices. A UDC supplier said OLED displays will be ready for widespread adoption once production challenges are resolved.

4) INDUSTRY SPECIALISTS

Three of the five sources commented on UDC's ability to defend its intellectual property: One thinks the patents are defensible but the materials are vulnerable to other developers, the second source thinks reverse engineering is a threat to UDC's technology and materials, and the third does not think licensing has proven to be a successful business model. He said companies will learn a technology and then patent their own ideas from it. Four of five sources expect OLED and UDC's sales growth to be limited in the short term because the technology is expensive and far from perfected for larger TV screens.

	UDC Patents Defensible	OLED Growth Expected
Display Lighting/Screen Design Engineers	↓	↑
Patent/Licensing Specialists	→	↑
Customers, Partners and Suppliers	↑	↑
Industry Specialists	→	→

Background

Universal Display Corp. experienced a [second-quarter increase](#) in licensing revenue and material sales, which could signal that adoption of OLED technology is about to ramp up. The technology is used in display screens and lighting, and offers several advantages including being ultrathin, having flexible glass capabilities, consuming lower power, and providing a clearer hi-def image. Interest in OLED displays was high at trade shows during the first half of this year. UDC is navigating several [attacks](#) on its patents and has acquired additional OLED patents through a recent [purchase](#) from [Fujifilm Holdings Corp.](#) (TYO:4901) in an effort to shore up its intellectual property. UDC also [hired](#) a new chief patent counsel to help strengthen enforcement and defense of its patents. However, a delay in the launch of OLED TVs has prompted Samsung and [LG Display Co. Ltd.](#) (LPL) to cut sales forecasts by 60% for 2012. Also, UDC could be affected by partner Samsung's loss of a patent lawsuit filed by Apple.

CURRENT RESEARCH

Blueshift assessed whether UDC can successfully defend its patent portfolio and use its licensing and material sales business model to increase sales for the remainder of 2012. We employed our pattern mining approach to establish sources in five independent silos, comprising 16 primary sources (including four repeat sources) and four secondary sources focused on the OLED industry:

- 1) Display lighting and screen design engineers (4)
- 2) Patent/licensing specialists (3)
- 3) Customers/partners/suppliers (4)
- 4) Industry specialists (5)
- 5) Secondary sources (6)

Next Steps

Blueshift will continue to research UDC's efforts to protect and grow its OLED intellectual property. We will reassess how UDC is affected by Apple's patent victory over Samsung. We also will gauge the rate of OLED adoption for displays and lighting applications and UDC's position within these markets. We will survey consumers for their preferred screen technology between Samsung mobile devices using OLED and Apple devices using Retina Display. Finally, we will look at active and pending lawsuits involving UDC technology and business partners, including potential litigation in Japan regarding UDC's OLED patents and Samsung's [suits](#) against LG.

Silos

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➤ Display engineer for an affiliated online retailer

UDC's patents need active defense as rivals pursue competing [LED](#) technologies. Samsung remains the primary consumer of OLED materials and should support UDC development and materials production for the foreseeable future. Apple and Amazon.com Inc. (AMZN) are unlikely to adopt OLED systems.

- "Whether UDC's patents are defensible or not, they evidently need their share of defending, not to mention active expansion. Meanwhile, there are a lot of people working on new ways to get more and better diodes to the market. Some of these avenues build on what UDC already has, so they'll have to pay. A lot don't."

- “From what I can tell, UDC has retreated from everything but [iridium materials](#) for now. That’s fine since the only commercial OLED screens are iridium, but it limits their range to react to breakthroughs in other metals.”
- “Samsung is still almost everything to them. If that deal had ended last year, UDC would be in trouble because alternative customers just haven’t come around yet. Nobody else is buying OLED in enough quantity to support the company’s costs. But the deal didn’t end, and now Samsung is obligated to buy a minimum amount from the company for several years to come. That gives them a nice base to hang around while mass OLED devices hit the market.”
- “If [Samsung Galaxy](#) devices sell well, UDC wins. If Galaxy suffers from the ongoing legal dispute between Samsung and Apple, at least UDC is covered because Samsung is probably buying close to its minimum amount of emitters now and the royalty is also at something like a base level. Samsung would have to scrap its phones and tablets worldwide and dump its contract entirely to pay UDC much less, and you know that would carry some significant breakup fees because UDC doesn’t want to let its main customer go.”
- “Amazon is not going to color LED any time soon. That’s a matter of public record. [Jeff Bezos](#) wants more vivid color before he’ll even consider it. [Grayscale LED](#) is another story, but that’s pure monochromatic white at various intensities and so is not part of the UDC colored [phosphor](#) emitter equation.”
- “Likewise, I don’t see an LED iPhone along UDC lines. ... It’s not really likely that Apple would choose to either buy LEDs from Samsung or, worse at this point, try an end run that would leave them open up to counterclaims of stealing the implementation. At best, Apple will probably go a third way somewhere beyond their existing Retina LCD and any [AMOLED](#) solution. Not sure there’s a place for UDC there.”

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*Display Engineer
Affiliated Online Retailer*

► Independent display engineer

UDC’s growth should continue. LED has broken through as a viable high-definition display technology. As long as price can be kept in line, the power-saving aspects of LED represent a competitive edge, especially in mobile and other battery-operated devices. Apple is not abandoning LCD display any time soon.

- “Universal Display stands to benefit as the supplier of record in terms of quality long-life phosphor elements. This allows device makers to replace fluorescent emitters that have previously gone into phones and other displays. The phosphor is expensive but not as expensive as the other systems you have to put in place to make high-definition, all-fluorescent screens work.”
- “One television represents a heroic amount of phosphor components when you consider that Universal Display has largely been selling into phones. A phone screen has maybe six square inches of active space. A 70-inch TV contains 1,100 square inches of screen, so each TV sold represents almost 200 times as much potential revenue for the phosphor manufacturer. Now maybe 260 million LED phones ship every year, whereas Samsung alone reliably moves 50 million televisions in the same period of time. If LED TV takes off, the impact for Universal Display is exponential.”
- “Right now a Samsung LED screen incorporating Universal Display phosphor costs maybe twice to three times as much as an Apple Retina LCD screen costs. The LED costs about one-third as much as the manufacturing price of the phone, so you can see that these screens are basically eating manufacturers alive, even those with an inside track like Samsung.”

Apple is not leaving Retina or LCD. Look at all the new Retina devices they’re releasing. Look at how Retina is rolling out across the product line, not narrowing to the cheaper form factors. Retina is still better than anything else in terms of intensity of color and reliability. Samsung OLED is good enough for prime time but not quite there, all in all. Until OLED gives Apple that kind of experience or there’s a compelling form factor reason to move to a flexible film-printed screen, Universal Display won’t be selling to Apple.

Independent Display Engineer

- “If the manufacturer is willing to eat the cost, they can sell LED screens as Retina-comparable with pixels smaller than the naked eye, no visible grid and so on. And LED is a lot cheaper in terms of power usage, which is extremely valuable in the Android world where charge life was always a bit of a pressing issue. I wouldn’t say LED allows for an Apple-beating power profile, but at the very least you’re a lot closer to an Apple match. If they can get everything else in line, recharge becomes an active selling point. Look at the Kindle’s long battery life as an example of this in action.”
- “Apple is not leaving Retina or LCD. Look at all the new Retina devices they’re releasing. Look at how Retina is rolling out across the product line, not narrowing to the cheaper form factors. Retina is still better than anything else in terms of intensity of color and reliability. Samsung OLED is good enough for prime time but not quite there, all in all. Until OLED gives Apple that kind of experience or there’s a compelling form factor reason to move to a flexible film-printed screen, Universal Display won’t be selling to Apple.”

➤ Display test engineer for a global semiconductor film producer

UDC stands to benefit from expanding demand for its pigments as OLED technologies mature, but the company is not a dominant or well-loved factor in the commercialization process. As it is, UDC has alienated several key manufacturers that could have helped it expand its share of the OLED market. Perceptions that the company is a Samsung satellite do not help.

- “We use their phosphor elements, but look, that’s the classic definition of a commodity product. When there’s a lack of acceptable substitutes, you pay the asking price, but if that price becomes onerous, you start to look for a way around the existing sources of supply. That’s exactly where Universal Display is. Everyone loves the phosphor and some people will pay to license their stack patents, but nobody’s really overjoyed with the business relationship.”
- “Look at who’s lined up against UDC and who their friends are. [Merck \[KGaA/FRA:MRK\]](#), [BASF \[SE/ETR:BAS\]](#), [Siemens \[AG/FRA:SIE/SI\]](#), [Koninklijke Philips \[Electronics NV/AMS:PHIA/PHG\]](#) are dead set on claiming their piece of the OLED supply chain. Samsung rules the space and is happy to keep UDC in their pocket in order to avoid rocking the boat, especially now that the Korean court upheld the patents there. If that ruling had gone the other way, Samsung would have dropped them and LG would never have come around. The Japanese are fighting the patents. I would expect the next viable non-UDC vendor to come from there.”
- “Many, if not most, of these companies have a very large stake in creating a vertically integrated LED platform. Fact is, simply capturing the synergy of a straight-through materials-to-device solution is worth more to any of these names than UDC is worth as a company. Samsung makes the OLED assemblies and the finished phones. It could make the TVs. The minute UDC pushes back or its pricing becomes onerous, Samsung can simply buy the company or go elsewhere, at which point it can pick up the assets on the cheap down the road anyway. UDC doesn’t have many other friends.”
- “The company is not really as active in developing its intellectual property as it is in defending it. They’re buying patents from people who control other elements of the OLED supply chain in order to broaden their relevance. They’re not really helping us come up with new and innovative ways to turn OLED into a huge industry and so make this technology more relevant to everyone and for everyone. We’re having to do that work.”
- “Samsung does that work by designing new pixel arrays around UDC pigments, but those pigments can be swapped out if something better comes along. We’re doing that work by finding ways to make OLED manufacturing scale. Competitors are doing that work by trying to build better mousetraps and things only OLED can do. The person who designs the first true ‘fabric’ commercial computer that flexes and folds will put OLED on the map, and then UDC or whoever controls the materials will be along for the ride. But they’re not leading the curve, and that’s important to point out. Their growth can at best match OLED

Look at who’s lined up against UDC and who their friends are. Merck, BASF, Siemens, Philips are dead set on claiming their piece of the OLED supply chain. Samsung rules the space and is happy to keep UDC in their pocket in order to avoid rocking the boat, especially now that the Korean court upheld the patents there. If that ruling had gone the other way, Samsung would have dropped them and LG would never have come around. The Japanese are fighting the patents. I would expect the next viable non-UDC vendor to come from there.

*Display Test Engineer
Global Semiconductor Film Producer*

growth. In the long term it's unlikely to beat it unless somehow their market share increases along with the overall OLED market."

- "They're expensive and spend most of their time within the OLED world figuring out ways to make good enough phosphorescent materials to replace the existing fluorescent cells. They're still working to make their technology acceptable for long-life consumer applications. Meanwhile, we're working to make LED technology cheap enough to bring to the consumer, and we don't really mind if it takes the current standard—fluorescent—to do that."

➤ **Physicist at a public university**

This scientist and his colleagues have created a new kind of OLED with the potential to be brighter and less expensive than OLEDs now used in cell phones and other electronic equipment. This new technology device uses an organic spin valve to store information through the spin of electrons. This technology is so different from a regular OLED and is not subject to UDC's patent protection. Because electron spins can have only two possible directions—up or down—the movements can translate to the zeroes and ones in binary code. One advance is that instead of just regulating electrical current, the spin valve produces light. Right now the device emits an orange light, but the scientists hope to expand to red and blue within a few years and eventually to produce white.

- "I am familiar with Universal Display, but this is a different technology from regular OLED. We have sent the story to publication and have a provisional patent. There should be no patent issues because this technology is completely different."
- "We can control the colors by magnetic fields while older kinds need more electrical current to boost light intensity. We've injected special carriers, and we can control the light intensity."
- "It's exciting. The next step will be to control the color and [be able to operate] at room temperature. Right now the temperature has to be below freezing."
- "The colors are brighter than those of regular OLEDs."

2) PATENT/LICENSING SPECIALISTS

All three sources think UDC will continue to grow in line with burgeoning demand for OLED displays. Two sources expect UDC to have difficulty in protecting its intellectual property because of the recent glut of infringement cases and negative public opinion against litigation. One coined the recent UDC patent cases as minor and yet requiring substantial effort to rectify. If OLED becomes a large revenue driver, companies with vast resources like Merck, BASF and Philips will be willing to team up to challenge UDC's patents. The dissenting source thinks the patents and licensing, if not too restrictive, could be a growth driver. He said cross-licensing is a better alternative than litigation. Apple's patent victory over Samsung is not expected to affect UDC sales.

➤ **Patent attorney**

UDC likely will not experience any fallout from the Apple-Samsung verdict because it is principally involved in hardware design. Samsung's devices will continue to require display screens regardless of the underlying software used to control the devices. UDC will have little to no recourse in protecting its technology once the patents expire, but it could reengineer its own technology and apply for a new patent. Tech companies that try to fight patent infringement through the judicial system are facing a harder battle, partly because of the glut of such cases in the federal system and public opinion of companies that own exclusive technology and charge more for it. Apple's victory over Samsung was something of an anomaly in patent prosecution.

- "They certainly cannot do anything with expiring patents. Reengineering is possible for a new patent and happens rather routinely."
- "Technology in the last few years went through such a transition, with a lot of innovation in hardware and software, that we've seen a backlash against patents in general. Almost all of the press you see about patent cases is negative. Patent law is supposed to be protecting innovation; just because consumers may have to pay a little more doesn't mean

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Patent Attorney

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- "Aggressive patenting and controlled licensing arrangements can hamper any company's ability to grow, Universal Display can absolutely hurt themselves by creating too many licensing and patent restrictions on the technology. Good fences make good neighbors. Patents can create an opportunity to collaborate, to build some great bridges between companies through cross-licensing. So patents should be viewed as bridges, not as barriers to entry."
- "The only thing to prevent a company from waiting out a competitor's patent expirations is the need to compete right now. Market forces may affect that. Regarding reverse engineering, it has more to do with copyright and trade secrets. If you copy another company's technology, then copyright infringement may come into play. If you copy the overall function without infringing on the trade secret, that's more likely to be successful and it can be done."
- "Patents are often very narrow in their scope of protection. A patent is more like a rifle shot than a shotgun approach. They are extremely fact-specific. There are so many factors that affect whether a company makes a good decision to buy a portfolio of patents. For example, if the Supreme Court says all software is unpatentable, it's impossible to draw any guidance from one trial court's decision. With the Apple win over Samsung, we will watch the appellate court much more carefully as that will have precedent on other federal courts. The broader issue that we have right now in software is it is very unsettled in terms of patentability. Universal Display's situation is focused more on hardware, so I do not think that will have as much of an impact in its dealings with Samsung. I would even say there's a likelihood that that the Apple case would not affect Universal Display as adversely since Samsung is facing software issues with the case."

➤ **Licensing and patent consultant; repeat source**

UDC will emerge unscathed from Samsung's loss to Apple's patent lawsuit. Filing suit for patent infringement is big business and may, in some instances, be a core part of a tech company's business model. But the main issue with Apple involves its major competitors, not the vendors that supply hardware to those competitors. Samsung still will need display screens, and the ultra high-definition afforded by OLED technology promises to be the next big thing in consumer TV. UDC can take advantage of that. However, many better-branded companies, including LG, have OLED technology and will compete in this market. LG [bought](#) Eastman Kodak Co.'s OLED assets in December 2009.

- "There's an awful lot of litigation going on. It's an opportunistic environment, suing your competitors and enforcing patents."
- "The demand for this technology is going to grow. The numbers are rough right now, but it's coming. OLED technology in home TVs is just starting to emerge. It has a superior picture and deeper colors. Samsung and LG are both getting into this. OLED will replace plasma and perhaps LED, assuming it can be manufactured reliably."
- "There are ways around UDC licensing, but it's not a single company that's involved. There are always ways to get around patents, but it depends on the complexity. A cross-license between companies may be a better alternative to the risk of a lawsuit. In fact, some companies may find a competitor trying to skirt patent laws and demand a cross-license—or else face a federal suit."
- "If you reverse-engineer a competing product, you infringe the patent. If you wait it out, it depends on how long you have to wait. A tech patent is good for 20 years, and that's a long time when technology is changing every 18 months."
- "I'd say the obstacles to growth are resolved. Patents and licensing, if they are not too restrictive, can drive growth. Licensing, especially. The consumer price will always be higher at the onset, but eventually it will be at the same price point as comparable devices."
- "The main challenges will be the ability to produce OLED reliably and cost effectively, at a good price point, as well as the ability to distribute it. A brand name is essential. There are loads of companies out there, Kodak included, that have the capability to do this."

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Licensing & Patent Consultant

► Founder of an intangible asset valuation and investment firm

UDC's patent position has not been tested because the technology's commercial value does not support the potential cost of building a competing portfolio, much less serious litigation. Recent disputes have been small-scale nuisances as far as industrial giants are concerned, but UDC has been forced to expend significant resources and attention defending itself. The materials-oriented nature of UDC's patent portfolio is also a matter of concern.

- "Universal Display is in the position where it didn't invent the underlying science but was simply in the right place to patent the applications first when the great IP land rush began and the universities started licensing out their programs. They have no history of internal development, and instead the record of 'prior art' in laboratories throughout the world is much, much stronger. The notion that iridium compounds glow under the right conditions was public knowledge and public domain for decades. That's not the most defensible position."
- "What forces UDC into this posture is the reality that any high school chemistry teacher could have fabricated their molecules in the classroom for decades, but now there's this patent. Any of those chemistry teachers could step up at any point and say, 'I did this before you; your patent is invalid on these grounds,' and UDC will be forced to defend itself from that. And if any chemistry teacher can do it, corporate interests can and will do it when they see an immediate opportunity to benefit themselves. If any of their labs were making iridium glow or were stacking phosphorescent materials in a certain way before UDC came around, they've got a case."
- "UDC is a \$2 billion company with a ballooning war chest of cash, so it can defend itself against \$1 billion or \$2 billion rivals but not the entire world. Surprisingly, UDC has a cash reserve of something like 18 months of current revenue now and that until about a month ago that reserve kept growing. That's a company that's either saving up for a huge purchase or buckling down for a fight. We saw the huge purchase from Fujifilm, but the prospect of a fight is not one they can win."
- "We know Merck, BASF and Philips are willing and eager to team up to challenge UDC's patents. These are companies with many billions of dollars in cash to throw at getting what they want. As yet, they haven't gotten serious about it, but you can read the writing on the wall. When and if phosphorescent LED screens become a big enough revenue driver to justify the legal costs, they can and will dive in and rip this company apart."
- "UDC can only grow to a certain point before that ugly legal fight begins. They're trying to grow around the limit by expanding their IP portfolio and getting into other LED technologies, moving up and down the value chain to find a safe niche and maybe someday the scale to defend itself better. Fuji was not the seller here so much as UDC was actively looking for something to buy and Fuji was happy to take the cash."
- "We will see UDC continue to do well until it hits a wall. You'll know that wall when the next wave of legal challenges shows up. The company might even win that round, but from there it becomes a question of whether the giants buy it, build or buy a competitive technology and standardize around that, or simply bury it in litigation."

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Founder, Intangible Asset Valuation & Investment Firm

3) CUSTOMERS, PARTNERS AND SUPPLIERS

Three of four sources view Universal Displays patents as defensible based on recent litigation in UDC's favor. The outlying source expects an increase in the LED market as well as in the willingness to pursue litigation by companies like Merck and BASF. All four sources expect growing demand for OLED devices. A UDC supplier said OLED displays will be ready for widespread adoption once production challenges are resolved.

► Marketing manager for a global appliance maker and UDC license holder based in Japan

Japanese patent courts have affirmed UDC's intellectual property. Increased demand for energy-efficient lighting should drive development of phosphorescent OLED systems, especially in Asia. UDC's OLED materials are expensive but offer manufacturers a lot of flexibility in terms of illumination intensity and device configuration. Competing technologies

simply do not generate the efficiencies required to provide an appreciable improvement over conventional incandescent bulbs.

- “Universal Display has a good phosphor product, and our courts have upheld their patents on it. We want them in our supplier pool.”
- “We thought about switching from Universal Display due to cost, but there was no real alternative for the applications we wanted to create. It takes phosphor to make a truly energy-efficient light—anything over double the efficiency of incandescent bulbs—and that’s the performance add we want. Universal Display is the best independent source of phosphor. Other light makers have their own internal sources, but we do not.”
- “Universal Display phosphor also gives us the ability to design very creative device shapes to solve illumination challenges. We can stack red and green to balance blue from certain angles, which is very useful for our unidirectional designs like light panels. And naturally that stack is why we entered into a license arrangement with them. The OLED stack is proprietary, and we want to build on it.”
- “Asia wants cheaper lighting from an electrical perspective, but existing fluorescent just does not provide the quality of light that Asian markets want or the efficiency that would make this a choice over incandescent bulbs.”

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*Marketing Manager
Appliance Maker & UDC License Holder
Japan*

► Senior executive for a global display materials manufacturer

Royalty relationships for UDC are unlikely to expand quickly because display makers will opt to buy materials and then license proprietary applications from each other. UDC’s patents on the materials themselves seem secure. LED displays are on the cusp of accelerated adoption as production challenges are resolved. This should boost UDC’s sales as more LED devices fuel demand for high-quality [phosphorescent emitters](#).

- “UDC’s hold on iridium looks secure, according to the world’s most influential IP courts. Whether that means keeping their hold on LED is another thing. People could decide to standardize the industry around some other phosphorescent chemistry, in which case UDC needs new patents because demand for their emitters will be in trouble. I think that’s what they’re looking to do, which is why the [fracas](#) over [osmium](#) in Europe happened. For now, though, I don’t see anything seriously emerging to challenge iridium.”
- “OLED is fast becoming ready for mass commercialization. This means UDC moves from a niche materials business to the electronics mainstream. I think LED sales doubling over the last year is only the first ramp, and we’ll really take off in 2013 through 2016. Whether UDC keeps its technological advantage over that time frame is not quite so clear, but for right now it’s their business to lose.”
- “The pigments are providing both the right intensity and more importantly a long enough life span to incorporate into consumer electronics within a normal replacement cycle. We can now make television that last decades, which means they hold up even over the seven or eight years it used to take a television to wear out and well beyond the shrinking time frame that today’s sets are becoming obsolete. And we now know how to manufacture very large LED films at scale, so the old hurdle there is rapidly falling.”
- “We used to struggle with fabricating enough high-grade film for a phone screen but now truly large televisions—and in theory, gigantic wall or building displays—are possible. It’s like any other process-oriented business like semiconductor or solar panels. You work to get scale up and quality up so there’s less waste and an overall better product, and then you can get price down to where it needs to be in order to disrupt the current state of the art. We’re on the edge of that now, and the commercial products are starting to come in to build demand we need to build the scale.”
- “UDC has the best red and the best green phosphor out there right now. I can’t really think of a better platform than iridium in terms of longevity for those pigments. Blue is hard and yellow requires some workaround, but someone may come up with innovation in terms of

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*Senior Executive
Global Display Materials Manufacturer*

replaceable screens some day and render the whole material degeneration question moot.”

- “UDC is selling a lot of red and just started selling green. As demand for LED display rises, demand for those pigments to fill the cells rises. Good for UDC, good for us too, and good for everyone else who sells emitters or layers or glass.”
- “I’m not so optimistic about their royalty income. In theory, they could be selling licenses to manufacture their pigments to other chemical fabricators, but that really just boils down to a supply relationship. UDC pays the factory to run the process, the factory gets that money and UDC then sells the emitters. Otherwise I don’t see many people eager to do independent work on iridium chemistry.”
- “The relationship with Samsung may be unique and really boils down to the right to experiment with finding new applications for LED using these materials and new ways to incorporate them into Samsung devices. This gives Samsung an end run around anyone else who might want to copy their pixel layouts, for example. Copy the layout, you have to fight Samsung and UDC now, and that royalty matters a great deal to UDC because it’s such a big part of their business and they are already known for being possessive with their IP. Could Samsung do it without paying UDC? Maybe. But they thought this was an easier way to lock down supply of these materials without having to engineer them internally or fight competitors for sources.”
- “The Samsung relationship may be an overlooked aspect of where Apple plays into LED. If Samsung matters so much to UDC, UDC may now be less eager to play with Apple. On the other hand, who wouldn’t want to be in the iPhone screen? Usually we see Apple suppliers terrified of being perceived of going over to the competition. This is the rare reverse where the kingpin customer may keep UDC in line.”
- “But in the Android universe, Samsung sells LED to anyone who wants to differentiate their display from Retina and will probably continue to do so. Buying [Super AMOLED from Samsung](#) essentially transfers the license that Samsung already purchased from UDC, so [Nokia \[Corp./NOK\]](#) and [HTC \[Corp./TPE:2498\]](#) and whoever are or were covered. They don’t have to go straight to UDC for a new license because they’re not making their own AMOLED arrays. Samsung makes something like half the world’s AMOLED, so you see the ceiling on the royalty component for UDC here.”

➤ Senior executive with a military contractor

UDC patents are defensible based on recent litigation; no near-term franchise threat exists. UDC has the best OLED materials available for heavy industrial applications and end markets in which performance is sought at any price. Consumer markets will be more difficult to crack. UDC sales to this contractor should increase if its programs are adopted.

- “The patents seem very well protected based on recent litigation. I can’t see any real danger to their business. We need them, and there are a few contractors in a similar position.”
- “We need LED interfaces because they’re not only more flexible than LCD but tougher more shatter- and stress-resistant. With that in mind, the iridium display films that UDC has made possible are really essential. We couldn’t roll out a few of our most advanced products without it. Nobody else that I can think of could have made that happen. They’re unique.”
- “We should be able to help push their sales up some if our latest programs get picked up. The process is not fast, but it should translate into thousands of very high-end screens for them over the next three years and then a rolling replacement going forward as these systems become what we hope will be the U.S. standard.”
- “UDC is very focused on collaborative innovation and is constantly coming up with new ways to monetize its patents. However, it’s expensive stuff, and I doubt civilian households want to pay an extra \$200 or more per screen just because it’s tough and has extremely low power drain. Pricing will have to drop before they get into every TV or phone screen.”

The patents seem very well protected based on recent litigation. I can’t see any real danger to their business. We need them, and there are a few contractors in a similar position.

Senior Executive w/Military Contractor

➤ Director of a nonprofit consumer of phosphorescent emitters based in Europe

UDC’s OLED materials are the most reliable for R&D purposes. Competitive pressures will test the company’s leadership as global chemical conglomerates move to commercialize OLED manufacturing processes. The economic potential for phosphorescent LED systems is larger than LCD display and low-power lighting put together.

- “Right now Universal Display has a lock on iridium because nobody else really wants much of it. It isn’t a big enough business to tempt BASF or Merck or some other chemical company to take the litigation risk. But you are seeing the first rumblings of interest now. The first probing lawsuits have started and will become more intense as LED markets evolve and as they coalesce around iridium. When that happens, I don’t think Universal Display can win either a war of attrition or even an outright legal dispute. The patents are there but untested.”
- “Right now LED is roughly a €5 billion market and LCD is maybe an €80 billion business. The room for growth is obvious. Applications like the ones we are working on would also take LED into more environmentally friendly lighting solutions better than either incandescent or fluorescent bulbs. This is still more than a few years out, and by that point I believe LED will have taken over the €80 billion LCD display business.”
- “We are very happy to be buying Universal Display phosphorescent materials for our labs and research. They can deliver the quantities and the quality we need. Price is not impossible, but the manufacturers would never pay what we pay because it would be impossible to pass on to the end user. Samsung must pay less, but they also buy in large enough quantity to get a lot of concessions.”
- “Other research organizations in our position buy small quantities of iridium phosphor materials. For LED applications, Universal Display is where you go for iridium. For other materials to benchmark against, you go to Merck, other vendors. Right now iridium is closest to commercial scale and being ready for mass-market applications.”

Right now Universal Display has a lock on iridium because nobody else really wants much of it. It isn’t a big enough business to tempt BASF or Merck or some other chemical company to take the litigation risk. But you are seeing the first rumblings of interest now. The first probing lawsuits have started and will become more intense as LED markets evolve and as they coalesce around iridium. When that happens, I don’t think Universal Display can win either a war of attrition or even an outright legal dispute. The patents are there but untested.

*Director, Phosphorescent Emitters
Consumer, Europe*

4) INDUSTRY SPECIALISTS

Three of the five sources commented on UDC’s ability to defend its intellectual property: One thinks the patents are defensible but the materials are vulnerable to other developers, the second source thinks reverse engineering is a threat to UDC’s technology and materials, and the third does not think licensing has proven to be a successful business model. He said companies will learn a technology and then patent their own ideas from it. Four of five sources expect OLED and UDC’s sales growth to be limited in the short term because the technology is expensive and far from perfected for larger TV screens.

➤ Head of an independent hardware testing group; repeat source

UDC’s patent portfolio appears secure, but commercial deployment of its materials remains vulnerable to disruption from rival developers with less overt ties to Samsung. Given aggressive contracting in recent months, increased revenue in late 2012 is almost assured. The longer-term view is much less certain. Galaxy sales are up as U.S. consumers rush to buy ahead of a possible prospective December [sales ban](#).

- “The specific types of LED materials Universal Display actually sells—the iridium compounds—are holding up well in the intellectual property courts. I see no challenge to that anywhere that would be unfriendly to Universal Display. As long as iridium is the hottest flavor of OLED on the market, Universal Display has all the cards. However, there’s nothing saying a true mass-market OLED will be iridium-based. If and when manufacturers go another way, Universal Display’s iridium franchise obviously becomes a lot less valuable.”
- “Samsung is the cure and the disease for Universal Display because Samsung rules both OLED and the global smartphone category, barring Apple of course, which as yet still uses a very high-grade LCD display technology. If Samsung stops using Universal Display materials, Universal Display’s share of smartphone sales evaporates. Unfortunately, because Samsung is also the primary source of the displays themselves, competitors are understandably reluctant to adopt OLED from Samsung that incorporates the Universal Display red and green cells. They’ll go elsewhere to avoid feeding the giant.”
- “That said, Universal Display has signed quite a [few contracts](#) in the early months of this year, and those products will be hitting the market in the fourth quarter. That means more per-unit royalties and larger volume sales of their phosphorescent compounds. The products may not be huge market successes in themselves, but

each one that incorporates Universal Display compounds is at least an incremental win. Manufacturers need to build a stockpile of the emitters before starting production and so on.”

- “I don’t think there’s a lot of new applications in the Universal Display pipeline, or else we’d be hearing about new wins. I think there was a push around the time the future of the Samsung relationship looked rocky and the survival of the enterprise was really at stake. Now there’s a sense that Samsung is assured for the long term, so the urgency to seal deals has relaxed. I don’t know what’s in the pipeline, but it can’t be too full. Of course, if Apple were to use iridium emitters in iPhone 5, that will change everything, but I doubt it. Apple isn’t too eager to use Samsung components right now.”
- “There’s also a surge of retail interest in Samsung phones right now, at least in the United States where the Galaxy may be banned in December. Android users love the Galaxy and seem to be pushing to upgrade before it might be too late. I don’t have any firm figures for you, but don’t believe anyone who tells you the decision killed Galaxy or caused some kind of backlash among consumers who worry about support or legal issues. What they’re worried about is losing their chance to buy Galaxy if the U.S. court rules in Apple’s favor. That’s accelerating the restocking cycle and should ideally help enhance Universal Display’s overall position in the smartphone market.”

The specific types of LED materials Universal Display actually sells—the iridium compounds—are holding up well in the intellectual property courts. I see no challenge to that anywhere that would be unfriendly to Universal Display. As long as iridium is the hottest flavor of OLED on the market, Universal Display has all the cards. However, there’s nothing saying a true mass-market OLED will be iridium-based.

Head of an Independent Hardware Testing Group

► Information display consultant, lighting engineer and expert witness in high-tech patent cases

UDC’s future is uncertain because it does not manufacture its own products and depends heavily on licensing, which is not a successful business model. No one can predict whether large OLED displays for computers and TVs will ever be ready for prime time. OLED technology is more expensive than LCD and has material problems, especially lifetime issues and attaining the color blue. Cell phones and other mobile devices offer a strong prospect for growth since they do not require a long lifetime.

- “UDC’s patents are defensible. They have phosphorescent OLED; Kodak has another class. What you have to consider is that patent litigation is a multimillion-dollar activity. Certainly UDC could defend its patents, but it has done a lot of cross-licensing and agreements with other companies already. Kodak has also been out peddling. In the display area, patent litigation is a dying art. The Apple case was an anomaly.”
- “The problem with UDC is that they can’t make their own products. They can’t tell what they want to be when they grow up. I thought they’d make displays, but no. They do a lot of licensing, but from a business perspective, licensing is a dead-end. ... Samsung licenses UDC technology, for example, but then it will work like gangbusters to understand it and create its own patents. Other companies will create manufacturing-type patents, and UDC can’t do anything about that. They can work cross-licensing, but I haven’t seen any successful models doing technology licensing.”
- “What UDC is trying to do in buying Fujifilm’s OLED patents is to build a portfolio to use as trading stock. The patents were not hugely valuable, I don’t think, but it will allow UDC to negotiate. They can say, ‘Let’s swap.’”
- “Universal Display has been around for years and years. They’ve kept working on their technology, and they have a large patent portfolio. But they’ve had problem with the lifetimes of some of their colors, particularly blue. With OLED, the fundamental problem all along has been how to solve the basic material problems: The atoms are just not lining up right.”
- “We’ve had really good luck with LCDs, on the other hand. We had temperature problems, all kind of problems, but every single one has been solved. If you had put it to a bunch of engineers in the mid-’90s and said will we have flat-panel TV soon, the answer would have been no. But that technology advanced very quickly. Now with OLED, we have struggled and struggled. It generally takes 20 years to bring a technology to fruition, but OLED is almost 30 years old now.”
- “The demand for OLED technology would be there if technology were there to meet it. UDC has been at it for a long time, and they keep saying the solutions are just around the corner. But I have to put a giant question mark there. It sounds good, but there is no one who can tell you that the basic material problems can be solved. We can’t predict whether OLED is going to get bigger and better or whether it’s going to hit a wall.”

- “Samsung and LG are going to be introducing some products. Sony [Corp./TYO:6758/SNE] tried and [pulled](#) their TV off the market. And I just read that the LG TV has been postponed until [2013](#). It indicates that OLED is not an easy thing to bring to market. They won’t tell you why it’s not coming out as promised, but it tells you something is not going as planned. ... We’re at an uncertain place in the display industry. It’s great that engineers and physicists are working on OLED. But whether that translates into a cost-effective product for larger displays remains to be seen.”
- “Would I buy a computer that uses OLED for display rather than LCD if it costs the same and has a good lifetime? Yes. OLED is nicer, the angle of view is wonderful, the colors are nice and bright. But if the OLED TV costs twice as much and doesn’t last as long, no, I’m not going to buy it.”
- “Certainly the smaller OLED displays [in smartphones] are OK. Smaller is always easier. These things are not expected to live for more than a few years, so you won’t have a lifetime problem. People don’t use the display all the time because they don’t want to run down the battery. It’s a different environment, and mobile is actually a good place for experimenting with OLED. There’s a lot more flexibility and room for expansion.”
- “With OLED you get a slightly nicer picture, but it’s not creating a whole new range of products, like LCD and plasma did with flat, portable displays in laptops and other things. Those of us in tech could not have predicted how much consumers loved the new products that were lightweight and flat. OLED is a good technology, but it’s not revolutionary.”
- “We’re down to just a few dominant players in OLED technology. Display building started in the U.S., then migrated to Japan, Korea and China. We’ve lost a lot of innovative players. Sony has gotten out of it. [Sharp \[Corp./TYO:6753\]](#), [NEC \[Corp./TYO:6701\]](#), [Panasonic \[Corp./TYO:6752\]](#) have given up or are struggling. Samsung is the big bear in the words, the big copycat and probably the most aggressive. LG is trying to keep up. Much of the original innovative technology came out of the U.S.; Korea and Taiwan, among others, were better at copying and doing manufacturing scale-up.”
- “The Apple suit won’t have that much effect on Samsung; they are not likely to change their behavior. Samsung has been very aggressive in copying other technologies and writing patents around them. Generally, their parents are pretty weak.”
- “I’ve served as an expert witness in various patent cases, and it’s important to note that you only have to make minor modifications to the original patent to [escape charges] of patent infringement. Interestingly, it doesn’t matter if someone has infringed on the fundamental patent or just a small part of it; it costs just as much to litigate. Also, the quality of the product doesn’t matter. It’s just that you have one.”
- “There’s nothing to stop people from waiting for patents to expire. Some of UDC’s patents must be getting pretty old now, although they may do some modifications to them and create new patents. And of course you can reverse-engineer UDC patents; everybody does that. There’s no litigation possible unless you sell a product with that technology.”
- “What other companies try to do is figure out how to modify UDC technology, maybe by changing the electrode structure or other refinements. If you came out with a smartphone that copied a UDC patent, then UDC could dismantle it and say, ‘You’re infringing on our patent.’ But if you can modify the technology and do a work-around, then you can use it. For a patent to be infringed, you have to meet every element of the claim. If you make a change, you’re not infringing.”

The problem with UDC is that they can’t make their own products. They can’t tell what they want to be when they grow up. I thought they’d make displays, but no. They do a lot of licensing, but from a business perspective, licensing is a dead-end. ... They can work cross-licensing, but I haven’t seen any successful models doing technology licensing.

*Information Display Consultant &
Lighting Engineer*

➤ **Founder of a mobile technology news website and podcast; repeat source**

The main liability for UDC is the chance that overseas companies will reverse-engineer the OLED technology and incorporate it into devices manufactured abroad, which is the case with most mobile devices. Cost is the major obstacle. The recent lawsuit loss to Apple will only have a brief effect on Samsung and the partner companies that supply technology for its products, including UDC. The suit affects only eight Samsung devices sold in the United States.

Universal Display Corp.

- “A lot of times these types of technologies are so specific, but yes, it could be reverse-engineered by a competitor trying to get around a patent.”
- “I don’t hear a lot about OLED technology with the latest products being announced. I know of no major products on the horizon that use this tech.”
- “Growth depends on adoption, and it’s all going to depend on whether the manufacturer can get it to a price point that’s acceptable to the consumer. A big challenge for Universal Display involves the end manufacturer. There has to be wide adoption by the manufacturers and acceptable costs associated with it. For the American consumer, the entry-level price on a high-end flagship device is \$200. Anything priced over that is going to be a challenge to reach any scale.”
- “Certain devices like some of the Samsung phones that have higher resolution screens are doing well, but people are not making a jump to something new just because of the screen technology. If you take something close to HD and compare it to something above HD, people will agree that it looks nice but that alone won’t sway them to buy the product. That’s not a good enough reason to buy. The screen will have to be a feature in addition to other attractive features.”
- “Low power consumption is one advantage with Universal Display. Ultra-high definition is another. Price is their major weakness. It’s a very costly technology to put on larger screens.”
- “We are noticing that a lot of consumers are looking at potentially dropping Samsung devices for one reason or another, not necessarily having anything to do with the Apple lawsuit, and that could impact future business with Universal Display.”
- “Samsung is a large enough business to weather this. They will have some things to iron out, but they are so big they will figure it out. We’re talking about only eight devices affected here. As a result, I don’t think it’s going to be a long-term issue for any Samsung suppliers. They’re the No. 1 Android manufacturer in the world.”

► Chief strategy officer of a North American technology consulting firm; repeat source

The high cost of UDC’s technology is the primary obstacle to gaining market share. Although the source could not comment on UDC’s ability to defend its patents, he said the technology likely could be reverse-engineered by competitors should the patents lapse. The OLED technology itself produces excellent image resolution. The high price will affect UDC’s marketplace reach.

- “We evaluated the OLED technology for some clients in terms of playback ability. The technology at the time was a little too expensive—actually, it still is—so they went with some older tech.”
- “I think Universal would need to achieve scale in the marketplace to service larger clients, so development agreements and the Fujifilm patent acquisitions would certainly help that effort. Universal will need to go to scale to service clients like Apple reliably.”
- “Right now, the volume is all in the low-end of the market. At their price they are not going to reach scale.”
- “There’s been a big internal debate at Best Buy over whether they should go with high-end or low-cost TVs. They’ve now moved toward low-cost LCD TVs. Before that, sets that had a price point over \$1,000 missed badly.”
- “It’s a tricky pricing game. OLED will have limited appeal. However, there are a lot of core differentiating features, especially picture quality.”
- “I don’t think there’s any awareness of them at the consumer level, and so there’s no real increase in demand, except for the early adopters.”
- “I think they need to brand it in some way like Dolby, for example. Dolby technology, as a brand, is instantly recognizable. People buy audio-video equipment branded with Dolby technology. Going to market with something that’s smart like that would be the way to go. They also need to come up with a brand name for it that’s not so geeky. I don’t believe they are a known brand at all.”
- “Excellent screen resolution is a primary advantage, but the price of the technology is a competitive weakness. But that will come down eventually, as with all technology. The picture quality is certainly defensible.”
- “I have no knowledge that anything would prevent a manufacturer from reversing-engineering the products once the patents expire.”

We evaluated the OLED technology for some clients in terms of playback ability. The technology at the time was a little too expensive—actually, it still is—so they went with some older tech.

*Chief Strategy Officer
N. American Tech Consulting Firm*

► Noted display calibration expert

OLED displays are aesthetically impressive but have yet to emerge as a truly viable competitor to the most advanced LCD screens. Even within the OLED ecosystem, UDC and its materials are still nowhere near the dominant solution, with perhaps a 2% share of overall OLED-oriented sales. LED TVs are years away from true mass adoption. Apple remains the true bottleneck for LED economies of scale, and its rocky relationship with Samsung is likely to stall development toward an LED iPhone or other iOS device.

- “By Universal Display’s own estimates, the entire OLED industry is roughly \$6 billion a year. They themselves might account for \$100 million of that. One single LCD television maker might move \$7 billion in screens a year, so you see right away that this is not exactly the age of LED yet. And while the LED business is roughly doubling every year, until recently Universal Display’s materials sales were not expanding by anywhere near that rate. They were actually losing ground in the industry.”
- “Green phosphorescent emitters are the key to Samsung’s LED displays and everyone expects Samsung to incorporate Universal Display green in their AMOLEDs as of now, essentially. This will help maintain Universal Display’s materials sales growth and might even accelerate it because Super AMOLED uses twice as many green subpixels as red ones. I can’t really say how much of that is already baked into the money Samsung has been paying Universal Display, but if other manufacturers follow suit, it should double the company’s materials sales right there as of the current quarter.”
- “LED TV is just not there yet. Announcements from the manufacturers are almost at the prototype level of telling the world that these devices are possible on anything like a consumer production scale. I’d put this technology at about where LCD screens were a decade ago in terms of mass adoption, simply because it can take that long for enough households to update their TVs and there’s no real form factor advantage here. You’re not going from a gigantic box to a slim panel anymore. You’re going from a slim panel to a slimmer panel and in a few years maybe a flexible panel. That flex form factor is where households embrace the new.”
- “You look around at new LED TVs, and they’re not being sold as LED screens at all. They’re being sold as the new generation of Internet-enabled displays with new functionality, added proprietary content, maybe 3D. They’re slim, but LCD screens are slim too as far as the typical person is concerned. And from what I can tell, LED TV manufacturers are offering massive concessions on price just to get their units into stores. I see 30% discounts from suggested retail almost across the board, which puts these screens on roughly a par with LCD. This is not a mass retail push but a toe in the water.”
- “The gap between LED and LCD resolution has narrowed enormously in just the last year as Samsung improves the pixel configuration in its Super AMOLED screens and other manufacturers keep pace. I think the new LED televisions are the greatest things I have ever seen, but they’re not going to replace existing flat-panel displays overnight, and on the smaller form factors I don’t see Apple shifting from Retina to AMOLED any time soon.”
- “Apple is the key holdout. Until Apple really moves toward an LCD display in its mobile devices—and not just rumors like we hear every year—there’s no way LCD really gets enough scale to bring price down and become the de facto display standard. And while a flexible iPhone 5 would be nice for the people who sell the LCD components that flexibility would require, it’s more likely that Apple will pursue an in-house solution that snubs most or all of those existing manufacturers. The Retina Display is already part of the proprietary iPhone experience, and they won’t throw that away if they can avoid it.”
- “Samsung dominates AMOLED modules. Apple and Samsung aren’t exactly the best of friends right now. I think that in itself suggests no AMOLED iPhone. Meanwhile, Nokia is struggling to sell its AMOLED phones, and HTC abandoned the technology entirely as too expensive. AMOLED lives and breathes according to how well Samsung’s devices fare, especially in Asia. And until the TVs are ready, Universal Display will continue to live and breathe according to Samsung as well.”

The gap between LED and LCD resolution has narrowed enormously in just the last year as Samsung improves the pixel configuration in its Super AMOLED screens and other manufacturers keep pace. I think the new LED televisions are the greatest things I have ever seen, but they’re not going to replace existing flat-panel displays overnight, and on the smaller form factors I don’t see Apple shifting from Retina to AMOLED any time soon.

Noted Display Calibration Expert

Secondary Sources

A review of secondary sources found discussion of and speculation over two missing Samsung OLED TVs using UDC technology lost en route to the [IFA](#) consumer show. Meanwhile, the delayed launches of OLED TVs may be a result of the devices' short life span. One source reported that the OLED technology market is expected to grow from \$4 billion in 2011 to \$44 billion in 2019, while another stated that growth will be limited by high retail prices. Still, new manufacturing facilities are being added to meet anticipated demand. New OLED competition is expected from a joint venture from Panasonic and Sony. Finally, in an effort to strengthen its defense of patents, UDC has hired Mauro Premutico, The Walt Disney Co.'s former managing vice president and chief patent counsel.

► Sept. 4 [Huffington Post article](#)

Samsung reported that two of its demo OLED TVs scheduled for display at IFA were missing. The company refused to comment on the possibility of "industrial espionage." OLED TVs are being discussed as the replacement to LCD TV, but the current \$10,000 price tag for a 55-inch set will prevent widespread adoption.

- "Two of Samsung Electronics' advanced OLED television sets have gone missing while on their way to the IFA consumer electronics fair in Berlin, the company said on Tuesday."
- "Samsung declined to comment on whether it believed the disappearance could be a case of industrial espionage, or on potential financial damages it could suffer from the loss of the technology."
- "Media reports had said it may have been a theft aimed at stealing the advanced TV technology, whose loss could cost the firm billions of dollars."
- "OLED systems are widely touted successors to liquid crystal displays (LCDs). They are used in smartphones such as Samsung's Galaxy Note because the displays are lighter, thinner and tougher than alternatives. However, in larger applications such as TVs, they are currently too expensive for mass-market sale. At a rumored price tag of \$10,000, the 55-inch models from Samsung and LG would be 10 times the price of an equivalent LCD TV."

► Sept. 3 [article](#) from The Verge

OLED TVs' high-quality images have sparked interest among technology trade show attendees, but the sets have yet to be released for general retail sales. Concerns over OLED's ability to withstand extensive use may be keeping the devices off the market. LG has missed its rumored summer launch, and Samsung's plans for a launch later this year appear to be in jeopardy.

- "Whether produced by Samsung, LG, or Sony, OLED televisions have been the perennial darling of technology trade shows, however they have yet to make the leap from the exhibition floor to retail shelf space."
- "This year, LG and Samsung seemed determined to put an end to the torment, with both using CES in early January as the launch platform for brand new [55-inch OLED TVs](#). The marketing teams jumped into overdrive—Samsung introduced the concept of [Super OLED](#), LG decided to add an extra white subpixel and wow us with [WRGB](#)—and stirred up an exciting and bright outlook for 2012. We weren't just going to finally get an OLED HDTV worthy of taking center stage in our homes, we were going to have a *choice*."
- "Fast-forward a few months and, alas, the entire CES hoopla looks to have been just more of the same. Hints about a summer retail release from LG have [come and gone](#), Samsung's stayed true to a 'second half of 2012' roadmap that is rapidly running out of road, and Sony's decided to sit out this year while developing [Crystal LED](#) and preparing for a [large panel OLED partnership](#) with Panasonic in 2013."
- "The problem large OLED panel makers are clashing against seems to be one of usage models: you can get away with a certain life span in devices like smartphones—where even the most intensive user won't have the display on for more than a few hours a day—that simply isn't adequate for TVs. Plenty of people keep a television on even when they're not watching anything in particular, just as background noise to whatever they're actually doing. OLED's ability (or otherwise) to handle this expanded utilization is likely what's behind the industry's hesitation to go to market."
- "Samsung and LG have poured large sums of money into OLED TV design and manufacturing, they will surely be looking to recoup their investments by actually putting a product out on the market. But for now at least, the OLED HDTV remains a vaporous mirage instead of the visual miracle we've long been promised."

► **Aug. 15 Venture Beat [article](#)**

The market for OLED devices is expected to grow from \$4 billion in 2011 to \$44 billion in 2019. Samsung has 70.7% of the OLED market. In the next three years, 10 new OLED production facilities will come on line in China, Japan, South Korea and Taiwan.

- “OLED displays to hit sales of \$44B by 2019, with growth in TVs and mobile devices.”
- “They cost a lot now, but OLED displays are one of the biggest hopes for the TV industry to sell more screens to a saturated market. The organic light-emitting diode displays are thin and vibrant, and by 2019 the market for those screens could reach \$44 billion, up from \$4 billion in 2011, according to market researcher DisplaySearch.”
- “That’s a significant annual growth rate, based mainly on the growth of mobile devices and TVs. Right now, the market is split into small screens for mobile devices such as photo frames, smartphones, Sony’s PlayStation Vita gaming handheld, and Samsung tablets. In 2011, those small screens of 5-inches or less sold more than 19 million units. In 2012, that number is expected to grow to 150 million units.”
- “Large screens are also on the growth path. Sony introduced an 11-inch active-matrix OLED TV in 2007. By 2009, LG introduced a 15-inch model. Sony introduced 17-inch and 25-inch models in 2011. And this year, Samsung and LG showed off 55-inch models at the Consumer Electronics Show. That compares to 100-inch-plus LCD TV screens.”
- “The earliest passive-matrix OLED screens started shipping in 1999, but now those screen sales are flattening. The active matrix OLED screens are growing a lot faster. Samsung has a commanding market share lead with 70.7 percent of the OLED display market. [Visionox](#) of China is No. 2 with 7.5 percent; [WiseChip](#) is No. 3 with 6.2 percent; [Pioneer \[Corp./TYO:6773\]](#) has 4.3 percent; [TDK \[Corp./TYO:6762\]](#) has 4.0 percent; and Sony has just 0.9 percent.”
- “A lot of new active matrix OLED display factories are in the works. In the next three years, 10 new factories will come online or be upgraded. All of them are in China, Japan, Korea, or Taiwan. As those factories come on line, Colegrove predicts rapid growth of OLED TVs after 2015. OLED technology is also used in small flexible displays as well as OLED lighting. The lighting OLED market is expected to hit \$6.3 billion by 2018. The presence of a companion market in lighting will help reduce the overall costs of the technology.”

► **July 31 [news](#) from OLED-Info.com**

Recent research revealed that the adoption of OLED TVs may be limited to only 1% of the total TV market in 2013 and to only 9% by 2017 because of high retail pricing.

- “ABI Research says that [OLED TVs](#) will only take less [than] 1% of the total TV market through at least 2013. By 2017, OLED TVs will reach 9% of the market. They say that the high prices of the TVs (LG’s and Samsung’s upcoming 55" OLED TVs will [cost around \\$10,000](#)) will limit the market size. According to ABI, consumers place price and screen size above all other factors—including display technology and image quality.”
- “While most analysts agree that OLED TV sales will be very low in the first few years, some think that the takeup will be quicker. LG Display themselves say that by 2014, [OLED may become the ‘mainstream’ technology](#), and [by 2017 OLED TVs will cost less than an equivalent LCD](#).”

► **June 25 Engadget [article](#)**

Addition OLED TV competition is expected from a joint venture between Panasonic and Sony. These companies’ late-to-market position could be rendered meaningless if they can reduce the anticipated \$10,000 retail price from first-to-market suppliers, Samsung and LG.

- “The [rumor](#) that Japanese electronics giants Panasonic and Sony would team up on [OLED](#) HDTV technology has been confirmed by a press release (included after the break), and the two plan to establish mass production in 2013. Together, they’ll be able to utilize the core and printing techniques that each has so far developed separately to roll out HDTV-sized OLED panels.”
- “Can this combination help them catch up to Korean counterparts [Samsung](#) and [LG](#)? Those two will individually put super-skinny, ultra high contrast ratio OLED HDTVs on store shelves this year, but if Panasonic/Sony can get prices down from the \$10k~ range then we’re sure most consumers will be able to overlook their tardiness to market.”

➤ **June 25 [article](#) from The OSA Direct Newsletter**

In an effort to strengthen its management and defense of its intellectual property and patents, UDC has hired Walt Disney's former managing vice president and chief patent counsel.

- "Universal Display Corporation has recently announced that Mr. Mauro Premutico, previously Managing Vice President and Chief Patent Counsel at The Walt Disney Company, has joined the company as Vice President, Legal and General Manager, Patents and Licensing. Premutico brings decades of experience in patent protection, intellectual property law, and licensing to Universal Display."
- "Mauro will lead our strategic initiatives to manage, defend, and further enhance our intellectual property. With his years of international experience in patent enforcement and defense as well as license negotiations, Mauro will play a key role as we move into the next phase of growth for our customers and shareholders."
- "Premutico's experience and expertise will help him succeed in managing Universal Display's patent portfolio, which is one of the largest in the OLED field and includes licensing rights to over 1,400 issued and pending patents worldwide in a broad array of OLED technologies, materials, and processes. Universal Display has entered into more than 30 business agreements with leading manufacturers in Japan, Korea, Taiwan, China, Europe, and the U.S."

Additional research by Scott Martin and Diana Hembree and Steve Evans

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